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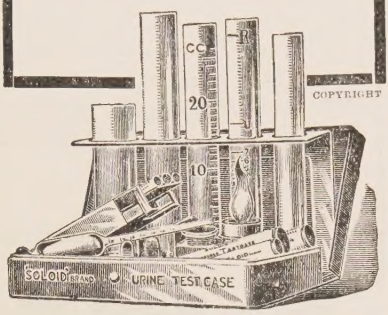

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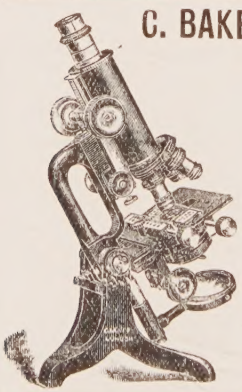

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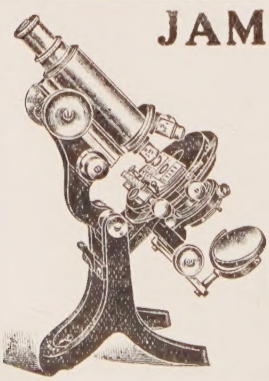

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 4.] 1914. [No. 6.

AMOEBIASIS AND DYSENTERY.

Amoebiasis.

Willets (David G.). **Intestinal Parasitism, particularly Entamoebiasis, in Patients of the Philippine General Hospital, Manila, P. I.** —*Philippine Jl. of Science.* Sect. B. Trop. Med. 1914. Feb. Vol. 9. No. 1. pp. 81-92.

This investigation, entailing a great deal of systematic work, was undertaken in order to supplement and extend the observations of Walker on the same subject [see this *Bulletin*, Vol. 3, p. 63]. Special attention was directed to determine (1) the frequency of infection with entamoebae in patients entering the Philippine General Hospital, and (2) the relative percentage of infection with *E. coli* and *E. histolytica* ; simultaneously statistics on the helminthic infection were also compiled. The stools were collected, after a preliminary saline aperient, from all inside hospital patients admitted during 1913, and two thin coverslip preparations of one specimen from each case were examined.

No stains were used, and three stages of entamoebae were recognised —the encysted, the active and the quiescent. The experience of the last few years has led the author to believe that, if several stool specimens of each case were systematically examined, the percentage of entamoebic infection would be found to be even higher than that recorded below. The figures obtained by various American investigators on the same subject during recent years vary greatly ; this is easily explicable, since they have not worked under precisely the same conditions. The author has been at great pains to distinguish between *E. coli* and *E. histolytica* in the vegetative stage, and concludes that only in the cysts can a differential diagnosis be made with certainty. In the vast majority of cases presenting a double infection *E. coli* cysts greatly outnumbered *E. histolytica*. In dysenteric stools the amoebae conformed almost exclusively to the description of active *E. histolytica* ; in other words the infections were apparently pure. The frequent association of *E. coli* and *E. histolytica* cysts in normal stools raises in the author's mind once more the debatable point as to whether they are not morphological homologues of the same species. It is possible, he thinks, that the *E. coli* may become active and alter

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its morphological appearances in a dysenteric stool. The positive results of the work can be summarised as follows :—

Entamoebae were found in 37·5 per cent. of the 1,000 individuals examined, in 38·8 per cent. of 900 Filipinos, in 26·0 per cent. of 100 Americans, in 46·3 per cent. of 417 adult female Filipinos, in 34·2 per cent. of 383 adult male Filipinos, in 25·0 per cent. of 100 Filipino children, and in 27·6 per cent. of 29 adult female Americans. Double infections were present in 59·2 per cent., pure *E. coli* infections in 35·5 per cent., pure *E. histolytica* infections in 5·3 per cent.

The encysted form is the only stage of development in which a differential diagnosis between *E. coli* and *histolytica* can be made with certainty.

P. H. Bahr.

Kuenen (W. A.). **De Entamoeben van den Mensch en de Amoeben-Dysenterie.** [The Entamoebae of Man and Amoebic Dysentery.] —*Geneesk. Tijdschr. v. Nederl Indië.* 1914. Vol. 54. No. 3. pp. 235-318. With 6 plates.

This is a descriptive account of the amoebae found in the alimentary canal of man, both pathological and other, for the benefit of Dutch readers. The latest researches on the subject are duly summarised and some good directions are given for the staining of the organisms. The clinical side of the subject is only lightly touched on. From the figures given by the author amoebic dysentery would seem to be an important cause of illness amongst the coolies employed on the plantations in Sumatra, the Chinese coolies being by far the chief sufferers. The six plates contain a large number of drawings of amoebae by the author of a very high degree of excellence.

J. B. Nias.

Izar (G.). **Studien über Amöbenenteritis.** [Studies on Amoebic Dysentery.]—*Beihefte z. Arch. f. Schiffs-u. Tropenhyg.* 1914 Feb. Vol. 18. Beiheft 2. pp. 5-39. [pp. 45-79.] With 1 plate.

Four articles on amoebic dysentery presenting nothing very novel to English readers versed in tropical diseases. The author is an Italian medical man, though he writes in German, and has drawn his material from the cases of Italian soldiers invalided from Tripoli. The first paper gives a clinical account of three cases of dysentery, of which one was fatal. The second describes the post mortem findings in a case of liver abscess. The third records some experiments with amoebae on cats, and the fourth contains brief observations on antibodies.

S. R. Douglas.

Christie (W. Ledingham). **Latent Dysentery, or Dysentery Carriers in Sarawak, Borneo.**—*Brit. Med. Jl.* 1914. July 18. p. 118.

The author thinks it probable that most of the debility, anaemia and fever ascribed to malaria in Borneo is due to the septic and irritated condition of the colon in patients infested with amoebae, who show no signs of blood or mucus in their stools till an advanced stage of ulceration has been reached. He concludes that 30 to 40 per cent. of the native population are dysentery carriers, that an early examination and treatment with salines clears the colon of amoebae and thereby prevents dysentery, and that much invaliding and debility are due to latent dysentery. P. H. B.

Lim Boon Keng. i. **A Brief Note on Amoebic Dermatitis.**—*Jl. Trop. Med. & Hyg.* 1914. July 1. Vol. 17. No. 13. pp. 193-194.

ii. **Preliminary Notes on Entamoebiasis.**—*Ibid.* Aug. 1. No. 15. p. 227.

iii. **Further Notes on Entamoebiasis.**—*Ibid.* Aug. 15. No. 16. pp. 244-246.

i. A form of cutaneous ulceration is described to which the Chinese at Singapore are particularly liable, and which the author infers is amoebic in origin and therefore curable by emetine injections.

ii. In the second paper the author wishes to ascribe to an amoeba the rôle of the pathogenic agent for a variety of conditions, including urticaria, bullous eruptions and ulcers, chronic bronchitis, peritonitis, and typhlitis (?).

iii. The third paper contains a description of the life cycle of this hypothetic organism, which is suggestive of a protozoon-fungus hybrid.

[It is difficult to understand what object is attained by the publication of papers such as these; they teem with dogmatic statements unsupported by experimental evidence, and are quite unsuitable for publication in a scientific journal.]

P. H. B.

Willets (David G.). **Preliminary Report on the Treatment of Entamoebiasis with Ipecac, Emetine, and Neosalvarsan at the Philippine General Hospital, Manila, P. I.**—*Philippine Jl. of Science.* Sect. B. Trop. Med. 1914. Feb. Vol. 9. No. 1. pp. 93-117.

The parasitotropic properties of some preparations now in use in entamoebiasis—ipecacuanha, emetine, salvarsan, neosalvarsan and bismuth—were tested in a scientific manner. The series consisted of 132 cases, of which 27 were dysenteric and 105 non-dysenteric. Under the former category the author has classed all those harbouring the cysts of *Entamoeba histolytica* in their stools. The incubation period of amoebic dysentery having been shown by Walker in his series of experimental cases to average 64·8 days, Willett therefore thinks that, by the discovery of the appropriate drug capable of destroying entamoebae in the cystic stage, it will be possible to prevent development of dysenteric symptoms in persons harbouring the cysts of the pathogenic amoebae.

From the fact that entamoebae are very unequally distributed in a given stool and in different stools passed by the same individual, it becomes a matter of great difficulty to estimate the intensity of an infection or to tell whether a specimen is truly negative.

In the treatment of dysenteric cases emetine was found more efficacious in causing the disappearance of symptoms than was ipecacuanha, though from the standpoint of expelling the entamoebae from the intestinal canal the two drugs were about equally efficacious. Of the emetine cases 91·9 per cent. recovered in an average of 3·6 days after the average administration of 0·287 grammes of emetine. In the corresponding ipecacuanha cases the figures were 62·5 per cent., 8·5 days and 16·3 grammes respectively.

In non-dysenteric cases, that is in those presenting no symptoms whatever, ipecacuanha was the more efficacious drug (70·8 per cent. as compared with 36·8 per cent.) in exterminating the entamoebae. Neosalvarsan (given presumably by the intravenous route) was efficacious in 100 per cent. of cases, though it is to be noted that the number so treated was small—*i.e.* eight.

From the foregoing it appears that ipecacuanha is a superior drug to emetine in its power of expelling entamoebae from the intestinal tract. The explanation of this may lie in the fact that the dosage of emetine varied widely and also that the drug was administered in some cases hypodermically, in others intravenously.

The author concludes that, in spite of his work, the relative value of ipecacuanha, emetine, and salvarsan in dysenteric as well as in non-dysenteric entamoebiasis requires much further observation.

P. H. B.

DUMAS (R.). **Malades traités par l'Emétine à Saïgon et au Cap Saint-Jacques pendant l'Année 1913. Dysenteries Amibiennes ou Mixtes.**—*Bull. Soc. Path. Exot.* 1914. May. Vol. 7. No. 5. pp. 405-406.

A table is given showing the results of the treatment of a series of cases of dysentery with emetine at Saigon and Cap Saint-Jacques during the year 1913. At Saigon 187 cases of dysentery, 70 of diarrhoea and 42 of acute congestion of the liver were treated, while at Cap Saint-Jacques the number was not quite so large, 51 being dealt with.

The author's conclusions in brief are that emetine has a rapid action on amoebic dysentery, but none on pure bacillary dysentery. He advises the application of the drug during convalescence, in hepatic congestion, and after operations for abscess of the liver.

G. C. Low.

SIEBERT (H.). **Ueber die Behandlung der Amöbenruhr mit Emetin.** [The treatment of Amoebic Dysentery by Emetine.]—*Arch. f. Schiffs- u. Trop. Hyg.* 1914. July. Vol. 18. No. 13. pp. 439-453.

Siebert considers that in his practice [plantation hospital, Java] there is only one objection to emetine, and that is the question of expense. On an average each case under treatment stays six days in hospital, and if vigorously treated absorbs 6·24 marks worth of emetine. On ipecacuahna the average stay in hospital would be about ten days and the cost of the drug 36pf. The former treatment is therefore 17 times more expensive [in drugs] than the latter.

He considers that there is still scope for the employment of ipecacuanha as an anti-dysenteric and that emetine is indicated (1) in acute amoebic dysentery; (2) in slight cases unable to take ipecacuanha; (3) in cases which do not react to ipecacuanha; (4) in cases which cannot be properly nursed.

P. H. B.

Deeks (W. E.). **Emetine in Amoebic Dysentery.**—*Ann. Trop. Med. & Parasit.* 1914. July 22. Vol. 8. No. 2. pp. 353-355.

Deeks has had brilliant results in his treatment of amoebic dysentery and liver abscess by emetine (6 cases); his method of administration does not differ from that employed by other authorities. He believes the drug is a direct poison to the amoebae as quinine is to the malarial parasite. In the majority of cases he considers three grains to be sufficient, but in more severe ones six to eight are necessary to produce a cure. Should diarrhoea persist, bismuth in large doses is advantageous.

P. H. B.

Hostalrich. **Note sur l'Emploi du Chlorhydrate d'Emétine en Injections Endoveineuses.**—*Bull. Soc. Med. Chirurg. de l'Indochine.* 1914. May. Vol. 5. No. 5. pp. 164-165.

A short account of the successful treatment of a case of amoebic dysentery with intravenous injections of ·05 cgm. (·077 gr.) of emetine hydrochloride. The author thinks the intravenous method is indicated in very acute cases.

[The almost microscopic dosage of emetine employed is remarkable.]

P. H. B.

Flandin (Charles). **La Recto-Colite Sèche d'Origine Amibienne; son Traitement par le Chlorhydrate d'Emétine.**—*Bulls. et Méms. Soc. Méd. des Hôpit. de Paris.* 1914. July 16. 3e Sér. Vol. 30. No. 25. pp. 104-111.

Chronic constipation is a common sequel to an acute attack of amoebic dysentery; this condition the author terms "dry recto-colitis." On sigmoidoscopic examination the mucous membrane is red, dry and ulcerated, and sometimes covered by a false membrane. A series of eight cases illustrates the author's arguments; it need hardly be added that every one of them made a rapid and complete recovery after numerous emetine injections. The author considers that every case of amoebic dysentery should be examined by the sigmoidoscope.

P. H. B.

Archibald (R. G.). **Emetine Treatment of Dysentery in Young Children.**—*Jl. Trop. Med. & Hyg.* 1914. June 1. Vol. 17. No. 11. pp. 161-163.

After having referred to the numerous papers which have been lately published on the therapeutic value of emetine in amoebic dysentery affecting adults, the author records the use of the drug in the treatment of this disease in children in the Sudan. One of these cases was a severe infection and the effects of the drug were delayed, living amoebae being present in the patient's stools even after a total of one and a half grains of emetine had been administered. The author finally arrives at the following conclusions:—

"1. Young children are extremely tolerant of the drug emetine. In severe cases of entamoebic dysentery it is advisable to commence with an initial dose of $\frac{1}{6}$ gr. for a child of two, and repeat this dose every twelve hours, till a total of $\frac{1}{2}$ gr. has been given.

"2. The total amount of emetine administered should be controlled by the evidence obtained by microscopical examination of the stools, a procedure which should also be carried out at intervals during convalescence.

"3. In order to avert relapses, the continued treatment by emetine after the patient's apparent recovery from dysentery would be advisable.

"4. In entamoebic dysentery of the Sudan emetine may require to be given in larger doses than are usually employed in other countries."

G. C. L.

BARLOW (Nathan). **The Administration of Emetine to Young and Debilitated Children.**—*Amer. Jl. Trop. Diseases & Prevent. Med.* 1914. June. Vol. 1. No. 12. pp. 864-865.

A white child of 16 months after recovery from an attack of malignant malaria still remained greatly debilitated. Examination of the faeces revealed great numbers of *E. histolytica* and consequently one-seventh of a grain of emetine was injected daily for two weeks. Great improvement and gain in weight were noted.

[The age of the patient is the main point of interest in this case. As a general rule infants are more liable to bacillary than to amoebic infection.]

P. H. B.

LORCIN. i. **Traitement d'un Cas d'Abcès du Foie par le Chlorhydrate d'Emétine.**—*Rev. Méd. et d'Hyg. Trop.* 1914. Vol. 11. No. 1. pp. 15-17.

ii. **Traitement de Dix-huit Cas de Dysenterie par le Chlorhydrate d'Emétine.**—*Ibid.* pp. 25-26.

i. Amoebic abscesses of the liver, the author states, get well of themselves more often than is supposed. In four years he has seen ten cases of the kind. They are small abscesses on the convex aspect of the liver, without much objective or subjective reaction. Relapse, to which they are subject, took place in four of the ten. Evidently, the author writes, the cure of these abscesses by emetine would not be a test of the efficaciousness of the treatment since spontaneous cure is the rule. These reflections, however, do not apply to large abscesses. He gives details of a case which certainly would have been fatal without the use of emetine. He was unable to procure this product [apparently he was in Madagascar], but succeeded in extracting the alkaloids from ipecacuanha.

ii. In two months the author has treated 18 cases of dysentery by emetine extracted as above from ipecacuanha. Sixteen were certainly of amoebic origin. The results in all cases were good. The advantage of emetine is not only a shortening of the duration of treatment, but that it permits a less strict diet, which is of importance when one has to deal with natives. It is not known if any of these cases relapsed.

A. G. B.

LE PAPE. **L'Emétine dans les Amibiases à Harrar (Abyssinie).** [Clinique d'Outre-Mer].—*Ann. d'Hyg. et Méd. Colon.* 1914. Apr.-May-June. Vol. 17. No. 2. pp. 547-551.

The author has had excellent results from injection of emetin hydrochloride in two cases of liver abscess subsequent to the evacuation of

the pus. The dysenteric motions contained in one case numerous balantidia as well as amoebae. From the rapid disappearance of the former after the full effect of the drug had taken place the author concludes that it has the same specific action on these protozoa as on the *Entamoeba histolytica*. P. H. B.

Nixon (P. I.). **Chaparro Amargosa in the Treatment of Amebic Dysentery.**—*Jl. Amer. Med. Assoc.* 1914. May 16. Vol. 62. No. 20. pp. 1530-1533.

This remedy, which the author has used in ten cases, he believes to be "the most efficient we have at present for treating amoebic dysentery unless we except emetine." Chaparro amargossa (bitter bush) has been a domestic remedy among the Mexicans of south-west Texas and Mexico for many years. Botanically it is *Castela nicholsoni*, Hook., and belongs to the Simarubaceae; one authority places it in the natural order Ochnaceae. It is a small thorny shrub found on low rocky hills. It is on the market as a fluid extract, the dose being one to three fluid drachms before meals. The author keeps the patient in bed on restricted diet and gives an ounce of magnesium sulphate three or four hours before the treatment and repeats it every two or three days. Six or eight ounces of an infusion of Chaparro are given by mouth half an hour before each meal and at bedtime; rectal enemata are also given. The author details some experimental observations to show the amoebacidal action *in vitro*. Details are given of the ten cases; *Entamoeba histolytica* is stated to have been present in each. The cases were of three weeks to four years' standing. There has been no recurrence, the period of freedom ranging from ten months to two years.

[It must be remembered that rest in bed on restricted diet and treatment by sulphates are themselves curative.]

A. G. B.

Heymann (P.). **Du Traitement des Dysenteries Chroniques Amibiennes par l'Air Chaud.**—*Bull. Soc. Méd. Chirurg. de l'Indochine.* 1914. May. Vol. 5. No. 5. pp. 170-181. With 2 figs.

Seeing that emetine has no action on amoebic cysts, it was considered advisable to try the action of hot air upon dysenterics, especially in the chronic stage. It was applied to the skin of the abdomen.

The therapeutic action was not very encouraging; pain was relieved, but no marked diminution was noted either in the number of vegetative amoebae or in their cysts; one case even developed a large hepatic abscess.

P. H. B

Vivie. **Hépatite Suppurée. Abcès Multiples. Mort par Ouverture d'un Abcès du Lobe Droit dans l'Arrière-Cavité des Epiploons.**—*Bull. Soc. Méd. Chirurg. de l'Indochine.* 1914. June. Vol. 5. No. 6. pp. 212-215.

As indicated by its title, this is an account of a case of liver abscess which, erupting into the lesser sac of the peritoneum, led to the death of the patient. At the post mortem an enlarged liver was found literally burrowed with abscesses of all sizes.

In the terminal stages the patient exhibited the following signs which suggested inflammation of the lesser peritoneal sac :—Distension of the epigastrium limited below by a horizontal line passing through the umbilicus, a dull pain intensified by pressure traversing the epigastrium in a horizontal direction from the centre of the right costal margin to the centre of the left, and oedema of the superficial tissues in this region.

In the discussion which followed the reading of this paper Gauducheau relates how he was able to produce dysenteric symptoms in a dog by intravenous inoculation of 5 cc. of pus from this case, even though he was unable at the time to find any amoebae in it by microscopical examination.

P. H. B.

Degorce (A.). **Dilacération du Parenchyme Hépatique dans un Cas d'Hépatite à Tendance Suppurative mais n'ayant constitué qu'un très Petit Foyer de Pus Collecté.**—*Bull. Soc. Méd. Chirurg. de l'Indochine.* 1914. June. Vol. 5. No. 6. pp. 218-222.

This paper records the case of a resident of Tonquin who had undergone an operation for hepatic abscess in October 1911. During the early part of January 1912, fever reappeared with hepatic symptoms ; an exploratory operation was performed and the liver incised in many directions, a small focus of suppuration being discovered. The result was that the patient made an uninterrupted recovery. The author thinks that, should such another case present itself, he would have recourse to exploratory punctures as being a safer procedure and one likely to be followed by the same beneficial results.

[The method of treating presuppurative amoebic hepatitis by multiple punctures is now a well-recognised one ; the exact effect of this procedure on the *Entamœba histolytica* is uncertain.]

P. H. B.

Brau. **Chlorhydrate d'Emétine et Formule Leucocytaire.**—*Bull. Soc. Méd. Chirurg. de l'Indochine.* 1914. Mar. Vol. 5. No. 3. pp. 87-90.

The report of a case of liver abscess following amoebic dysentery, in which the administration of emetine caused a marked amelioration of the symptoms, but the liver remained enlarged and leucocytic counts showed increased polynuclear cells and diminished eosinophiles.

This condition continuing, the liver region was explored by aspiration and a large abscess was located and opened. About a fortnight later a second abscess burst into the lung and the patient made a good recovery.

Several leucocyte counts are given. S. R. D.

Bonnefay & Maille. **Abcès du Foie Amibien avec Association de Bacilles de Koch.**—*Bull. Soc. Path. Exot.* 1914. June. Vol. 7. No. 6. pp. 475-479.

The pus of an hepatic abscess is generally sterile. Should a micro-organism be present it is generally the staphylococcus. The authors therefore consider this case, in which an acid fast bacillus—presumably the tubercle bacillus (as found by an inoculation experiment) was present in the exudate as worthy of record.

The patient made a fairly good recovery after operation and emetine treatment. Suspicious signs were discovered at the apex of the right lung, but a radioscopic examination showed no tubercular lesions anywhere.

P. H. B.

Simonin (J.). **Abcès Multiples et Indépendants du Foie et du Poumon Droit, consécutifs à une Dysenterie Amibienne, contractée au Maroc.**—*Bulls. et Mémes. Soc. Méd. des Hôpit. de Paris.* 1914. June 25. 3 sér. 30 Ann. No. 22. pp. 1175-1186. With 3 charts and 3 figs.

The patient, a soldier, suffered from dysentery in 1911 while on the March to Fez, but hepatic symptoms remained latent and unsuspected for a long time. Repeated aspirations proved negative. The spleen was enlarged, there was a definite haemoglobinuria towards the end and sanguinopurulent expectoration. At the necropsy three abscesses were found in the liver and two in the right lung, one of which had burst into the right bronchus, quite independent of the hepatic suppuration. At the post mortem the large intestine was greatly infiltrated and ulcerated. Death was apparently due to thrombosis of the pulmonary artery. No lesions were found in the kidneys to account for the haemoglobinuria. A few amoebae were found in the pulmonary but not in the liver pus.

The author thinks that malaria played little part in the pathogenesis of this case as malaria parasites were never found in the blood.

[The amoebic origin of the illness does not appear to have been recognised in life and there is therefore no record of treatment with ipecacuanha ; it is necessary to add that the case occurred in 1911, that is, before the introduction of emetine.]

P. H. B.

Duckworth (Dyce). **The Diagnosis and Treatment of Tropical Hepatic Abscess.**—*Practitioner.* 1914. July. Vol. 23. No. 1. [No. 553]. pp. 1-6.

The diagnosis of tropical abscess as occurring in this country is only liable to be confused with suppurative pylephlebitis and pyaemic abscess ; the latter are generally small and multiple, while the former is of a large size and is commonly a single lesion.

It is interesting and instructive to note that to Sir Dyce Duckworth's knowledge emetine was employed with success—by a Mr. William Eccles, a senior surgeon to the Great Indian Peninsular Railway in Bombay—in 1869 in the treatment of acute dysentery.

[It would be instructive to know on what grounds bacillary dysentery is included as a cause of hepatic abscess. Suppuration occurring in the course of a dysentery of bacillary origin is probably the result of some secondary infection.]

P. H. B.

Noronha (A. J.). **Hepato-Pulmonary Abscess treated by Emetine.**—*Brit. Med. Jl.* 1914. May 23. p. 1122.

In the case described in this note there was history of cough and bloody expectoration of three years' duration. An injection of one grain of emetine was given daily. Three weeks later the patient was quite well.

A. G. B.

Craig (Charles F.). **The Classification of Amebas with Observations on Morphology and Life Cycle of *Entamoeba coli*, *Craigia hominis* and *Vahlkampfia lobospinosa*.—*Arch. of Internal. Med.* 1914. May 15. Vol. 13. No. 5. pp. 737-769. With 2 plates and 2 text figs.**

The author in the present paper adopts Calkins' classification of the Amoebae (see this *Bulletin*, Vol. 3, p. 74), and adds "the latest observations on *E. coli*, *Craigia hominis* and *Vahlkampfia lobospinosa*." It is admitted that the old genus Amoeba should be split into several genera, and that some of the free-living forms may reach the intestinal canal of man *viâ* contaminated food. It is believed that some of these free-living forms may become temporary parasites in man. The amoebae cultivated from faeces are considered to belong to free-living forms acquired with food or by air contamination.

With regard to the genus Vahlkampfia, most members are free living but some may become parasitic under certain conditions. "It is probable that nearly all species of Vahlkampfia may be cultivated on artificial mediums, and it is this fact that has given rise to so much confusion regarding the cultivation of the true parasitic amoebas." These organisms frequently contaminate material derived from patients suffering from entamoebic dysentery. Such Vahlkampfia have been cultivated in impure culture, but it is considered that "the claims . . . . that the amebas so cultivated are identical with true entamebas are unsupported by any adequate evidence."

Vahlkampfia lobospinosa is a true free-living amoeba. When grown in pure culture it undergoes marked morphological and cyclical changes as shown by Calkins and Williams [see this *Bulletin*, Vol. 3, p. 79], but in human faeces it has the morphology of a true Vahlkampfia. If Vahlkampfia live parasitic in the human intestine, it is an abnormal mode of existence and no symptoms of disease are produced. The cysts of Vahlkampfia resist drying better than those of Entamoeba. A list of species of Vahlkampfia is given.

Craigia hominis (*Paramoeba hominis*) was observed by Craig in 12 patients suffering from chronic diarrhoea. It contains a nucleus, an accessory nuclear body and has an amoeboid and flagellate stage of development. Multiplication is by simple division and by the formation of cysts containing minute flagellated organisms.

Trimastigamoeba philippinensis has three equal flagella when flagellated. Its nucleus is of the *limax* type and it has a contractile vacuole. It may contaminate faecal or other material from human sources, but there is no evidence that it occurs as a parasite in man or animals. It can be cultivated.

The genus Entamoeba is discussed and a list of species given. Many of the forms reported from man are probably not valid species; *E. minuta* and *E. tetragena*, being parts of the life cycle of *E. histolytica*, must disappear as species names; *E. nipponica*, *E. tropicalis* and *E. williamsi* are identical with *E. coli*, and so also are eliminated.

The second part of the paper is concerned with details of *E. coli*, *Craigia hominis* and *Vahlkampfia lobospinosa*.

With regard to *E. coli*, the chief new points deal with the occurrence of degenerating *E. coli* during the vegetative stage. In such organisms the nucleus may be invisible or distorted and the cytoplasm contain chromidia, as in *E. histolytica*. Enucleate entamoebae and free nuclei are also encountered. Cysts with eight nuclei are common, but as many as 16 nuclei may be present. Sometimes degenerating cysts contain compact masses of chromatin resembling the chromidial masses so characteristic of the cysts of *E. histolytica*. The nucleus of *E. coli* is said to be larger than that of *E. histolytica*, and its cyst wall is thicker.

Craigia hominis varies in morphology in its different stages. Craig has been able to "study each stage of development, including encystment, the formation of the swarmers, the process of longitudinal division of the flagellates and the development of the amebic from the flagellate stage." The "swarmers" possess a single flagellum. A full account is given of each stage. There is no evidence that *Craigia hominis* is pathogenic, except that it was found in patients suffering from chronic diarrhoea and that treatment causing its disappearance also resulted in a cure.

Vahlkampfia lobospinosa is described and a summary of recent work on Vahlkampfia is given. Craig states that "no amount of evidence based on mere changes in morphology or life-cycle produced by growing free-living amebas on unnatural culture material can be considered as of the slightest value in connecting them with the true entamebas, but that at most these variations simply indicate the path by which the present species of entamebas reached their parasitic mode of existence."

According to Craig, *Vahlkampfia lobospinosa* is the organism cultivated originally from human faeces by Musgrave and grown by Williams and Calkins on brain-tissue medium. [See this *Bulletin*, Vol. 3, p. 79.]

[The paper deals with *Entamoeba coli*, *Craigia hominis* and *Vahlkampfia lobospinosa* very exhaustively and the original should be consulted by all interested in amoebic dysentery. The morphology of each organism is illustrated by photographs.]

H. B. Fantham.

Craig (Charles F.). **The Differential Diagnosis of the Intestinal Entamebas of Man.**—*Archives of Internal Medicine.* 1914. June 15. Vol. 13. No. 6. pp. 917-944. With 16 figs.

This paper contains a useful differential diagnosis of *Entamoeba histolytica* and *E. coli*. The author lays stress on the value of observation of the living organisms, using stained preparations for confirmatory purposes. For permanent preparations he recommends

fixation by Schaudinn's fluid (corrosive sublimate alcohol) and staining by Mallory's ferric chloride haematoxylin. A summary of the important points in the differentiation of *E. histolytica* and *E. coli* is given :—

Vegetative Stage of Development : Living Preparations.

E. histolytica.	*E. coli.*
Actively motile.	Sluggishly motile.
Ectoplasm glass-like. Clearly differentiated from endoplasm.	Ectoplasm poorly differentiated from endoplasm. Not glass-like in appearance.
Nucleus often indistinct or invisible.	Nucleus visible and distinct.
Erythrocytes present in endoplasm when stools contain blood. Very characteristic.	Erythrocytes absent from endoplasm when stools contain blood.

Vegetative Stage of Development : Stained Preparations.

Delicate nuclear membrane and minute karyosome, when *histolytica* type of nucleus is present.	Thick nuclear membrane and large compact karyosome.
Well-defined karyosome surrounded by an unstained area and containing a centriole, when the *tetragena* type of nucleus is present.	Centriole generally invisible or indistinct.
Smaller granules and clumps of chromatin on inner side of nuclear membrane.	Large granules and clumps of chromatin on inner side of nuclear membrane.
Cyclical changes very marked in the nucleus when the *tetragena* type is present.	Cyclical changes less marked in nucleus.
Erythrocytes present in endoplasm when stools contain blood.	Erythrocytes absent from endoplasm when stools contain blood.

Precystic Stage of Development : Living and Stained Preparations.

In both the living condition and in stained preparations the differentiation of *E. histolytica* and *E. coli* is most difficult in this stage of development, and often impossible. The diagnosis should rest on the character of the vegetative or cystic forms that are almost invariably present together with the precystic forms.

Cystic Stage of Development : Living and Stained Preparations.

E. histolytica.	*E. coli.*
Cyst smaller.	Cyst larger.
Cyst wall thin. Double outline less frequently observed.	Cyst wall thick. Double outline frequently observed.
Cyst contains characteristic chromidial bodies.	Cyst does not contain chromidial bodies.
Cyst contains from one to four nuclei ; never over four.	Cyst contains from one to sixteen nuclei, the normal number being eight when the cyst is fully developed.

In conclusion, the author states that, in his opinion, " stained cysts are more readily differentiated than the living cysts, and in the search for ' carriers ' of these bodies better results will be obtained if stained preparations are made, as well as living preparations."

H. B. F.

James (William M.). **A Study of the Entamoebae of Man in the Panama Canal Zone.**—*Ann. Trop. Med. & Parasit.* 1914. July 22. Vol. 8. No. 2. pp. 133-320. With 6 plates and 5 text figs.

This well-illustrated memoir of nearly 200 pages is really a monograph on the entamoebae of man, as seen in the Panama Canal Zone. The author reviews the more important literature and deals with the life-cycles of *Entamoeba histolytica* and *E. coli* in detail. There is also a section devoted to a descripion of the best methods of technique (fixation and staining) for studying entamoebae. Lastly there is a bibliography.

It is quite impossible in the limited space at disposal to summarise this monograph in full. Many of the points discussed have been reviewed separately in previous volumes of this *Bulletin*. In addition we may note that "three types of pathogenic entamoebae have been found associated with acute dysentery in the Canal Zone. That most commonly found corresponds in all details to the organism described by Schaudinn and by Craig as the vegetative stage of *Entamoeba histolytica*. . . . Much less common in acute dysentery is the organism described by Hartmann as the vegetative stage of *Entamoeba tetragena*. . . . Three times I have encountered an organism which, in fresh preparations, is identical with" the first type, but which, "when wet fixed and stained, shows characteristics intermediate between" the first and second types.

E. tropicalis (Lesage) and *E. williamsi*, *E. poleki*, *E. hartmanni* and *E. bütschlii* (v. Prowazek) are considered to be apparently "various phases in the life-cycle of *E. coli*."

The author wisely remarks that "it is not possible at times dogmatically to say, with respect to nuclear morphology in the vegetative stage, that a certain entamoeba must belong to a certain species." He is doubtful about schizogony stages. In some preparations enucleate amoebae as well as free nuclei were observed.

The author writes that "it is certainly true that *histolytica* forms occur in infections in which most of the entamoebae show the *tetragena* type of nucleus, and the converse is also true." "The *histolytica* type is found in acute primary amoebic dysentery, and in relapses of exceptional severity." "The *tetragena* type . . . . is associated with chronic and sub-acute dysenteries." Two types of pathogenic entamoebae were found in mild or in latent dysentery. "When there is a history of recent dysentery, the entamoebae have for the most part the nuclei and cytoplasmic appearance of the small *tetragena* forms; when there is no history of recent acute dysentery, they show the characteristics of the *minuta* type."

As regards chromidia James concludes that "they are derived from the cytoplasm by a process of condensation in the latter, and have nothing whatever to do with nuclear chromatin."

The six plates, of which two are in colours, contain 156 figures.

H. B. F.

Aragão (Henrique de Beaurepaire). **Ueber** *Entamoeba brasiliensis*. —*Memorias do Instituto Oswaldo Cruz*. 1914. Vol. 6. No. 1. pp. 5-10. With 1 plate.

Entamoeba brasiliensis was previously described briefly by the author

in 1912. It occurred in firm faeces of a patient suffering from anaemia due to ankylostomiasis. Additional details with regard to the parasite are now given. The parasites in the faeces were usually encysted; if free they were not active and were about to encyst. Administration of faeces containing cysts per os and per rectum to kittens did not produce infection. Fresh preparations showed the cysts as rounded bodies with a single nucleus, small vacuoles and cell inclusions. Vegetative stages were 10μ to 15μ in diameter, showed finely alveolar cytoplasm, small inclusions and food vacuoles. The nucleus was karyosomatic, but no centriole was seen in it.

The cysts have denser cytoplasm and more obvious inclusions than the free forms. In uni- and bi-nucleate cysts large vacuoles are unusual. The number of nuclei in a cyst varies from 1 to 8. Cysts with 4 nuclei are from 7μ to 10μ in diameter, while those with 5 to 8 nuclei are from 12μ to 15μ. Phases of nuclear division are rare in cysts; the first division only is easy of observation. The karyosome divides first, a tiny but atypical spindle being formed. The remainder of the nucleus then divides also and the nuclear division is repeated. Sometimes the inclusions dwindle, more often they remain. The chromidial masses do not seem to be analogous with those in *Entamoeba tetragena*, but form siderophile threads and bundles. Siderophile threads are often double. The threads may be small or large. Sometimes they stretch across the cyst and divide it into two. This arrangement the author thinks may be significant of sexual evolution in the cyst, preceding copulation. The peculiar thread-like chromidial masses are characteristic of *Entamoeba brasiliensis* and separate it from *E. coli*.

H. B. F.

Baetjer (Walter Albert) & Sellards (Andrew Watson). **Continuous Propagation of Amoebic Dysentery in Animals.**—*Bull. Johns Hopkins Hosp.* 1914. June. Vol. 25. No. 280. pp. 165-173. With 1 plate.

A series of interesting experiments is narrated. Two strains of the disease were investigated with the object of securing continuous propagation by subinoculation through a series of animals. The first strain was lost in the second passage by accident. The second was carried through eleven successive passages in kittens. This strain increased in virulence and no degenerative changes appeared in the morphology of the entamoebae obtained at the site of active lesions. The characteristics of the clinical course and pathological lesions were retained throughout the eleven passages. The propagation, however, proved to be considerably complicated by the virulence of accompanying bacteria. The successful propagation of one strain through eleven passages in animals, with an increase in virulence of the entamoebae and a retention of the typical features of their morphology is, the authors believe, in conformity with the general laws of protozoan and bacterial infections.

G. C. L.

Mathis (C.). **Procédé Rapide de Fixation et de Coloration pour reconnaître aisément les Kystes d'Amibes dans les Selles.**—*Bull. Soc. Med. Chirurg. de l'Indochine.* 1914. May. Vol. 5. No. 5. pp. 182-185. With 1 plate.

An account is given of a method for the rapid fixation and staining of cysts of entamoebae, the process described taking less than two minutes, an important factor for rapid diagnosis in cases of dysentery. The technique is as follows :—

(1) A thin smear of faecal matter is made on a slide.
(2) Immediately, without drying, the slide is placed over a one per cent. aqueous solution of osmic adid for thirty seconds.
(3) Stain the moist smear with an aqueous solution 1 in 200 of haematoxylin, the solution being that used for Heidenhain's iron-haematoxylin method.
(4) Wait a few seconds, then cover the smear with a cover glass, pressing out any excess of liquid. Dry the edges with blotting paper.
(5) Examine direct.

If a permanent preparation be desired, the edges of the cover-slip must be luted with paraffin or other media.

Preparations so made show a brownish cytoplasm and deeper stained nuclei. It is easy to see and to count the nuclei in the cysts, and the cyst walls show clearly. A plate of 23 figures of cysts of *Löschia histolytica*, *L. coli*, *L. legeri* and *Vahlkampfia* sp., showing the characteristic appearances of the cysts, is an illustration of the value of this rapid method of preparation.

H. B. F.

Bacillary Dysentery.

Job (M. E.). **La Dysenterie Bacillaire dans l'Armée.**—*Arch. de Méd. et de Pharm. Militaires.* 1914. Jan. Vol. 63. No. 1. pp. 57-94; Feb. No. 2. pp. 143-181; Mar. No. 3. pp. 328-359.

In these papers the author gives a very complete summary of the work that has been published on the bacteriology of the dysentery bacilli, their identification, etc. He also discusses the spread of the various epidemics that have been reported, and from these he passes on to various forms of prophylaxis that have been undertaken to prevent such epidemics occurring, and gives at the end of his paper a very long list of references.

These papers are a very valuable contribution; they should be read in the original by all who are interested in the subject of bacillary dysentery.

S. R. D.

Kerandel. **Dysenterie Bacillaire (Distribution Géographique et Bactériologie).**—*Ann. d'Hyg. et Méd. Colon.* 1914. Apr.-May-June. Vol. 17. No. 2. pp. 462-478.

This is a general text-book account of bacillary dysentery, dealing especially with the bacteriology; it contains no original observations.

It is interesting to note that the author, who evidently possesses a first hand knowledge of the subject, deprecates the terms pseudo- and para-dysentery as designating conditions produced by distinct varieties of the dysentery bacillus. He takes Dopter's view that they are all feebly marked varieties of one and the same bacillus—*B. dysenteriae*.

P. H. B.

Sergent (Edm.) & Nègre (L.). **Recherches des Bacilles Dysentériques et des Vibrions Cholériques dans les Selles de Pèlerins Musulmans Nord-Africains revenant de la Mecque, Sains en Apparence.** *Compt. Rend. Soc. Biol.* 1914. June 19. Vol. 77. No. 21. pp. 104-106.

Pilgrimages to Mecca of Mussulmans from the north of Africa were forbidden for some years by the French Government, but in the year 1913 they were allowed again. On the return of these people from Arabia observations were made upon them at the lazaret at Cap Matifou. Carriers of bacillary dysentery and cholera were found, thirteen of the former out of 67 pilgrims, and the authors point out that their researches show that these people, even though they present no special symptoms of these diseases, may nevertheless act as carriers and are thus capable of contaminating their own villages and localities, where sanitary arrangements are not of a high order.

G. C. L.

i. Blühdorn (Kurt). **Das klinische Bild der bazillären Ruhr im Säuglings und Kindersalter.** [The Clinical Picture of Bacillary Dysentery in Infancy and Childhood.]—*Monatsschr. f. Kinderheilkunde.* Orig. 1914. Vol. 13. No. 1. pp. 37-50.

ii. Schild (Rudolf). **Bakteriologischen Befunde bei Bazillenruhr im Säuglings- und Kindesalter.** [Bacteriological Results in the Bacillary Dysentery of Infancy and Childhood.]—*Ibid.* pp. 51-60.

These two papers are concerned with the details of an outbreak of bacillary dysentery, which occurred in the children's ward of the University Clinic at Göttingen in the summer of 1913. The clinical histories of 14 cases are given in full, with observations on the varying character presented by the disease in young children. In two fatal cases the chief pathological change observed in the intestine was swelling and injection of Peyer's patches and the neighbouring lymph-follicles. A diet of whey gave the best results.

Out of 51 samples of stools sent to the laboratory for examination, bacilli referable to a dysenteric type could be isolated only from nine. Numerous tests of the usual kind were applied to the organisms found, for the details of which reference may be made to the original paper.

S. R. D.

Broughton-Alcock (W.). **Antidysenteric Vaccination.**—*Brit. Med. Jl.* 1914. Aug. 8. p. 306.

The publication of this paper, which embraces observations which may be of considerable importance in the prevention of dysentery amongst the millions of troops at present in the field, has been precipitated by the present international crisis and may therefore be regarded as of the nature of a preliminary communication.

A twenty-four hours' culture of *B. dysentericus*, preferably the true Shiga strain, on peptone agar is washed in ·9 per cent. saline and centrifuged. The resulting deposit is diluted in 2 cc. fresh saline and heated to 56° C. for one hour and enumerated; this amount (2 cc.) is then placed in 20 cc. normal human serum or 10 cc. horse serum. After centrifuging this mixture thoroughly twice the deposit is mixed with ·9 per cent. saline, so that 1 cc. of this mixture contains 350 million bacilli to the cc. Preventive injections are made, four at a time, of ·25 cc. each into the loose subcutaneous tissue. A second course of 2 cc. (in doses of ½ cc. each) is given eight or nine days later.

The reaction caused by the injection is never severe. Out of a total of 200 subjects so far treated, in an area in which bacillary dysentery is common, not one has so far contracted the disease.

The sera of patients treated in this manner showed no increase of agglutination power to the dysentery bacilli or of specific amboceptor, in this respect differing from the behaviour of human sera injected with untreated bacilli. The author claims for the method described above great simplicity and rapidity in technique, and for the injections both prophylactic and therapeutic properties.

P. H. B.

Barber (Marshall A.). **The Variability of Certain Strains of Dysentery Bacilli as studied by the Single-cell Method.**—*Philippine Jl. of Science.* Sect. B. Trop. Med. 1913. Dec. Vol. 8. No. 6. pp. 539-557. With 1 plate and 1 text fig.

The following is the author's summary of his paper:—

"1. From a culture of *Bacillus dysenteriae*, Flexner type, derived from a single cell, three series of single-cell isolations were made at intervals of about five months. The first series gave 5 maltose-fermenting variants out of 21 isolations; the second, 5 out of 60; the third, 1 out of 123. The other single-cell cultures as well as the parent culture render maltose alkaline.

"2. The non-fermenting type produces secondary colonies consisting of normal and involution cells, either of which may develop acid- or alkaline-producing cultures. An ordinary transfer from a secondary colony, including many cells of both sorts, gives an acid-forming culture.

"3. Selection from the acid-producing type failed to produce any but similar types, and selection from the alkaline-producing type gave only alkaline, provided secondary colonies were not chosen.

"4. Mixed cultures, consisting of an equal number of cells of each type, showed that the two types may exist side by side through from 10 to 15 daily transfers, but with a tendency for the acid to outstrip the alkaline.

"5. Transfer in maltose broth gave no increase in the acid-producing power except in old cultures.

"6. Growth in various substances other than maltose failed to alter materially the characteristics of the two types.

"7. In a specific serum, the two types showed approximately the same agglutination.

"8. A permanent new race, characterized by morphological peculiarities, was obtained by the selection of an aberrant cell from a culture of dysentery of the Shiga-Kruse type."

A description of the special technique required for making one-cell cultures in series is given, and those interested should consult the original paper for these details.

G. C. L.

Jonesco-Michaïesti (C.) & Combiesco (D.). **Sur une Epidémie de Dysenterie Bacillaire chez des Singes Inférieurs.**—*Compt. Rend. Soc. Biol.* 1914. May 22. Vol. 76. No. 17. pp. 827-829.

The authors note that previous workers have studied spontaneous dysentery in Macacus monkeys. The organisms isolated belonged in most respects to the Flexner type, but possessed also characters approximating them to the Y type. They have isolated a strain of bacilli which had caused an epidemic of dysentery among monkeys kept in their laboratory (Bucharest) for other experiments. After a short period the monkeys died with classical lesions of the large intestine and mesenteric glands, myocarditis, fatty degeneration of the liver and epithelial nephritis. The contents of the large intestine were sown on Conradi-Drigalski medium and on bouillon bile and an organism was isolated having characters which are described. It is a short bacillus, 1-3μ long, not staining by Gram and easily cultivated on all the usual media. The authors had at their disposal only two agglutinating serums, one polyvalent, prepared in the laboratory with the bacilli of Shiga, Flexner, Dopter and Duval and the Y bacillus, the other agglutinating only the Shiga type. The authors made agglutination experiments with these serums. The conclusion reached was that according to the majority of the cultural characters the bacillus isolated belongs to a type near to the Flexner bacillus, whereas according to agglutination it approximates to the Strong type.

A. G. B.

Flagellate Dysentery.

v. Prowazek (S.) & Werner (H.). **Zur Kenntnis der sog. Flagellaten [Dysenterie].**—*Beihefte z. Arch. f. Schiffs- u. Tropenhyg.* 1914. June. Vol. 18. Beiheft 5. pp. 155-170. [pp. 311-326.] With 1 plate and 1 text fig.

Lamblia and Chilomastix (syn. Macrostoma, Tetramitus) are often seen in the faeces of patients in the hospital of the Tropical Institute at Hamburg.

S. v. Prowazek reviews the occurrence, geographical distribution, morphology and pathogenicity of *Lamblia intestinalis*. The flagellate is 10μ to 25μ by 5·86μ to 12μ broad. Multiplication cysts contain four nuclei. Binary fission occurs within such cysts. Autogamy stages were not seen. Cats and guinea-pigs may be infected by Lamblia cysts, while mice have been found dying of colitis due to Lamblia. Faeces containing Lamblia are gelatinous, and in the mucus free flagellates and cysts with vacuolated gut epithelial cells occur.

Chilomastix is next considered. The synonymy is complicated. Generic synonyms are Monocercomonas, Epstein; Tetramitus, Perty; Macrostoma, Alexeieff; Fanapepea, Prowazek; Difaemus, Gäbel; Cyathomastix, Rodenwaldt. *Chilomastix mesnili* occurs in man.

Chilomastix flagellates are Trichomonas-like, measuring 3μ to 14μ by 3μ to 6μ. They have a vesicular nucleus containing an oval karyosome. The cytostome is large. There is an undulating membrane, best seen in life, but not always very obvious. Binucleate cysts, about 7μ long, are found, which give rise by multiple division to tiny flagellates 3μ to 4μ long. Brumpt, Nattan-Larrier, Gäbel, Epstein ascribe pathogenicity to Chilomastix.

H. Werner contributes a second section consisting of clinical observations :—

Case 1. — Butcher, aged twenty, infected in Morocco, showing diarrhoeic stools, with mucus and blood. Stools contained Lamblia, Chilomastix and *Entamoeba tetragena.* Treated in Hamburg with emetin. The drug acted on Entamoeba, Chilomastix and flagellate forms of Lamblia, but the cysts of Lamblia were resistant.

Case 2.—Stoker, aged thirty-five. Diarrhoeic stools contained numerous Dibothriocephalus eggs and flagellate Chilomastix. Extract of male fern caused both the eggs and the flagellates to disappear from the stools.

Case 3.—Indian, aged seventeen. Diarrhoea and fever. Chilomastix in stools. Treated with quinine for malaria. The diarrhoea also gradually decreased.

Case 4.—Seaman, aged twenty-six. Taken ill at Rosario. Diarrhoeic evacuations contained Chilomastix and Lamblia (free and encysted). Treated by Uzara (2 tablets, three times daily), both flagellates disappeared in a few days.

Case 5.—Government assessor in German East Africa, with previous history of dysentery. Chilomastix, flagellates and cysts found in the stools. The author considers that the Chilomastix here had an etiological significance.

Case 6.—Ship's officer, aged twenty-two. Taken ill with diarrhoea after leaving Bombay Harbour. Stools containing blood and mucus showed Lamblia flagellates and cysts and spirochaetes. Treated with emetin. Further details to be published later.

Case 7.—Engineer, aged thirty-five. Dysentery contracted in Natal. Amoebae and Lamblia flagellates in the stools. Emetin treatment, Lamblia cysts resistant.

The pathogenic rôle of the flagellates, in these cases, is difficult to determine, since other organisms were usually present in the digestive tract. These gut flagellates may find suitable conditions of existence in patients suffering also from amoebic dysentery. They may gradually disappear when the patient is sent to bed and put on diet. Uzara and extract of male fern appeared to be useful in certain cases. Emetin is without action on Lamblia cysts, though it acts on the flagellates.

H. B. F.

Mathis (C.). **Troubles Intestinaux dus au Protozoaire Flagellé. *Lamblia intestinalis* (Lambl. 1859).**—*Bull. Soc. Méd. Chirurg. de l'Indo-chine.* 1914. Feb. Vol. 5. No. 2. pp. 55-62. With 2 plates.

This interesting paper deals with *Lamblia intestinalis,* which can, under certain conditions, excite intestinal complaints in man, giving rise to simple diarrhoea with dysenteriform stools. *Lamblia intestinalis* is fairly common in the digestive tract of Muridae.

Fairise and Jannin (1913) published an account of a case of chronic dysentery due to Lamblia, the patient being an old soldier who had served in Indo-China. Lamblia were found within the intestinal ulcerations, having penetrated as far as the connective tissue and the muscular layer, a rare condition.

Mathis has observed in Tonkin a number of such cases of diarrhoea. He gives details of four. The first was that of a child three years old. The stools were at first glairy and blood-stained, containing many Lamblia, mostly encysted. The flagellates disappeared from the stools after two days. The child's home was infested with mice. The second case, aged four, showed numerous stools with cysts of Lamblia, but neither mucus nor blood. The house of the patient harboured

numerous rats. The third case was that of a man aged 29. He had suffered from diarrhoea, with stools containing unidentified flagellates, in May, 1911. There was no further trouble for nearly two years, partly spent in France. In March 1913, there was recurrence of diarrhoea, and Lamblia were found in large numbers in the stools. Daily washings of the intestine with "liqueur de Labarraque" were performed, and the patient underwent a course of further therapeutic and dietetic treatment. In spite of this the Lamblia persisted for at least four months. The fourth patient was 28 years of age and was under treatment for malaria, when he suddenly suffered from diarrhoea, with glairy and bloodstained stools, containing Lamblia cysts. The Lamblia infection lasted for a week.

"To sum up, the troubles due to *Lamblia intestinalis* are slight," and not as serious as in amoebic dysentery. Prognosis is favourable. Emetin hydrochloride is without action on Lamblia. The parasite should be diagnosed microscopically, a magnification of 400 to 500 diameters being sufficient.

The relative frequency of diarrhoea due to Lamblia in Tonkin is explained by the great abundance of rats and mice, whose dejecta soil unprotected food. According to Noc, the Lamblia may also be water-borne. Healthy carriers of Lamblia cysts also are known, and act as reservoirs of the parasite. Mathis found 5 out of 100 Annamese sharpshooters to harbour the parasite, while Noc in Saigon found 50 per cent. of the population infected.

During a discussion which followed the reading of Mathis's paper, Degorce mentioned three cases of chronic diarrhoea in Europeans due to Lamblia, and Thibault described a case in a child, probably contracted from mice.

H. B. F.

Marques Da Cunha (Aristides) & Torres (Magarinos). **Sobre alguns Casos de Colite produzidos pelo** *Chilomastix mesnili* **(Wenyon, 1910).** [Cases of Colitis due to *Chilomastix mesnili*.]—*Brazil Medico.* 1914. July 22. Vol. 28. No. 28. p. 269.

An account of five cases of chronic diarrhoea in children, apparently caused by *Chilomastix mesnili* (Wenyon), which was found in pure culture in the stools. Two of the children, aged six and eight years respectively, had suffered from a benign form of looseness of the bowels for a long time, while two others, of one and three years of age, developed the same symptoms on coming to reside with the elder ones. The fifth case, observed subsequently, was also in a child, eighteen months of age, and a native of the same locality. Nothing is said about the treatment. These are the first cases of the kind observed in Brazil. A detailed study of the material obtained is reserved for a future communication.

J. B. N.

Derrieu & Raynaud (M.). **Dysenterie Chronique à Flagellé Nouveau.** —*Bull. Soc. Path. Exot.* 1914. July. Vol. 7. No. 7. pp. 571-574.

The authors give an account of a case of chronic dysentery due to a new flagellate, which they name *Hexamastix Ardin-Delteili*. The patient, aged 42, a cellarer, lived at Oued-el-Alleug, Algiers, and was

treated at the medical clinic of Mustapha in December 1913, for chronic diarrhoea and general weakness. The history of the patient is given.

In February 1913 he suffered from abdominal pains with abundant diarrhoea, seven to eight stools in 24 hours being passed, but they were neither mucoid nor blood-stained. They ceased after four days. About March 30th a shivering attack occurred, followed by fever every two days for a fortnight. Icterus appeared with highly coloured urine and two pale liquid stools were passed daily. After fifteen days the fever ended, but the patient still remained a little yellow and there was pain on the right side. The stools increased to 15 per day, and were less copious and muco-sanguinolent. The patient suffered from pain in the pit of the stomach and rectal tenesmus. After treatment with quinine in the hospital at Blidah he was slightly better, but the diarrhoea reappeared after he left hospital and did not cease.

The patient, when admitted to hospital at Mustapha, was very emaciated and feeble, with a muddy complexion, a dry, scaly skin, hippocratic (clubbed) fingers and myoidema. He complained of constant thirst and his breath smelt of acetone. His tongue was smooth, red, coated, and a little dry. His digestion was not good. Slight retraction of the stomach occurred and aortic pulsations were felt in the epigastric region. Pressure over most of the colon was painful. Twenty to thirty stools in 24 hours were passed, with anal smarting. Slight hypertrophy of the liver occurred. The spleen was normal. There was anaemia. The serum did not agglutinate the bacilli of Flexner or Chantemesse-Shiga.

Various unsuccessful treatments by ipecacuanha, collargol, neosalvarsan, urotropine and sulphate of soda were carried out till February 2nd, 1914, when Escomel's treatment for Trichomonas dysentery was tried—2 gm. turpentine by the mouth and three enemata daily of the following mixture :—

Essence of turpentine	20 drops.
Laudanum	10 drops.
Yolk of egg	1 ..
Distilled water	250 cc.

By the 10th February the treatment was stopped, the patient being completely cured.

Examination of Stools (Fresh). If examined immediately a hot stage was not necessary. Actively motile oval elements as large as a leucocyte were seen. In rapid movement neither flagella nor undulating membrane could be distinguished, but when movement slowed after 15 to 30 minutes it was easy to see these structures. In some cases the oval body was prolonged into a tail. The organisms usually encysted in 20 to 30 minutes. The parasites were numerous but disappeared after turpentine treatment. No other parasites were seen in the stools.

Stained preparations. Wet fixation over bromine vapour for about 15 minutes was best. Giemsa stain was used. The parasite measured 10 to 15 μ long by 9 to 13 μ broad. Nucleus and blepharoplast were present. Close to the blepharoplast arose an undulating membrane terminating in a flagellum, as well as five flagella varying in length from 10 to 17 μ. There was also an axostyle. The parasite is allied to *Trichomonas intestinalis*, but is distinguished by the constant presence of five flagella.

The flagellate dysentery due to *Hexamastix ardin delteili* is probably epidemic in the country where the man dwelt. The authors state that essence of turpentine seems to be a specific for this malady.

H. B. F

Assmy. **Zur Frage der Emetinbehandlung der Lamblienruhr.** [Treatment of Lamblia-Dysentery with Emetine.]—*München. Med. Wochenschr.* 1914. June 23. Vol. 61. No. 25. pp. 1393.

A case of lamblia dysentery in a Chinaman is recorded. A few active lambliae, many cystic forms and spirochaetes were found in the dysenteric stools. The condition of the patient materially improved and all protozoal parasites disappeared from the faeces on no other medicament than a suitable diet and daily doses of magnesium sulphate. The author thinks, therefore, it would be unwise to claim any specific action for emetine, such as in the case reported by Martin Mayer [see this *Bulletin*, Vol. 3, p. 466].

P. H. B.

Ardin-Delteil, Raynaud, Coudray & Derrieu. **Un Cas de Dysenterie à *Balantidium coli*.**—*Bulls. et Mém. Soc. Méd. des Hôpit. de Paris.* 1914. July 9. Vol. 30. No. 24. pp. 2-6.

The authors describe in this paper what they consider to be the first record of balantidial dysentery in French literature. The description of the patient's (an Algerian native's) clinical symptoms is given in great detail and calls for little comment. The stools were frequent and were composed of bloodstained mucus. There was great tenesmus. Microscopical examination revealed large numbers of very active balantidia. Neither the administration of emetine hydrochloride nor of protargol had any influence on the parasites.

[As the patient suffered from pulmonary tuberculosis of the right apex, the clinical picture may have been complicated by tubercular ulceration of the intestinal tract.]

P. H. B.

Mixed & Unclassed Dysentery.

Deeks (W. E.). **Dysenteries in the Canal Zone, with Special Reference to Amoebic Dysentery.**—*Ann. Trop. Med. & Parasit.* 1914. July 22. Vol. 8. No. 2. pp. 321-352.

The term dysentery designates a condition in which there are frequent movements of the bowels attended generally by griping pains and tenesmus; in the ensuing dejecta are to be found blood, pus and mucus. The following forms of dysentery are more or less frequently met with in Ancon hospital and can for the most part be readily differentiated.

(1) Amoebic dysentery caused by the *Entamoeba tetragena* of Viereck, or the *Entamoeba histolytica* of Schaudinn.

(2) Bacillary dysentery caused by Shiga's or Flexner's bacillus and allied varieties.

(3) Bilharzia dysentery caused by *Schistosomum mansoni*.

(4) Balantidium dysentery caused by the *Balantidium coli*.

(5) Malarial dysentery in the course of a general malarial infection.

(6) Tubercular dysentery due to tubercular ulceration of the intestine.

(7) Nephritic dysentery, or dysentery associated with acute diffuse nephritis, or secondary to chronic nephritis.

(8) Diphtheritic dysentery or colitis, associated with a diphtheritic or gangrenous inflammation of the mucous membrane—a very fatal form.

(9) Dysentery in the course of pellagra.

(10) Dysentery resulting from the ingestion of decomposing meats or fish, or infected milk (probably a bacillary infection).

(11) Dysentery secondary to cardiac or hepatic disease.
(12) Dysentery associated with typhoid ulceration.
(13) Clinical dysentery of undetermined etiology, cases of which occur in large numbers in the Canal Zone, especially in the month of May.

During the years 1911 and 1912 out of 334 cases of dysentery admitted to the Ancon hospital 63 were of amoebic origin.

Etiology of dysentery due to the Entamoeba histolytica. Evidence collected in Panama points to the probability of the transmission of the infection by means of uncooked vegetables. There is evidence also that water is a possible source of infection: since the water supply has been installed in Panama and the cisterns have been abolished, amoebic dysentery has almost disappeared; prior to this the water supply was derived from water tanks and wells in the yards and there was no sewerage system. The only recent cases Deeks has attended in Panama were among those who have abandoned the regular water supply for cistern water. There appears to be no endemic centre. Every village on the Isthmus contributed one or more cases, generally in proportion to the population. Though cases occur in every month of the year, the greatest prevalence is in March, April and May.

Pathology. The lesions are most common in the caecum and sigmoid, but in severe cases the whole colon, sigmoid, rectum and even a small portion of the ileum adjacent to the caecum may be involved.

It is possible that incidental infections, such as those of Trichocephalus, Ankylostoma, Ascaris, Oxyuris and Bilharzia, while bearing no relation to the presence or development of entamoebae, may, by causing minute lesions of the mucosa, assist the entrance of these pathogenic organisms. Should the physiological function of the bowel be interfered with by extensive dysenteric lesions, stools consisting of blood and mucus will result; while should only one or more small ulcers exist, the bowel is able to maintain its functions with the passage of formed and even constipated motions.

Symptomatology. Latency was a marked feature of the cases and it is interesting to note that two were operated upon for chronic appendicitis. The clinical forms met with can be divided into acute and chronic types.

The author lays stress on the doughy, inelastic skin, which is invariably present in amoebic dysentery and which he considers of diagnostic and prognostic importance, though it is by no means peculiar to amoebic ulceration.

The course of the acute infections is variable; they may prove fatal in a few days with a sloughing, gangrenous or perforated bowel and a subsequent secondary infection. In some of these cases, before the fatal termination takes place, entamoebae are carried in great numbers to the liver and myriads of small necroses result. The leucocytosis is variable and cannot be considered characteristic. Twenty-three per cent. of the deaths were due to complicating liver abscess—single or multiple.

Treatment. The methods of treatment adopted need only be briefly discussed, as the results obtained, though excellent in themselves, have been surpassed since the introduction of emetine. The administration of bismuth subnitrate in heroic doses (180 grs.) every three hours night and day, together with saline or plain water irrigation of the bowel three times daily, gave the best results. Deeks is of the opinion that the curative power of bismuth subnitrate rests largely

on its antiseptic action on the symbiotic putrefactive or fermentative bacteria, or it may be, according to JAMES's work, a direct action on the entamoebae themselves. Five cases treated in this manner showed symptoms of poisoning. The patients became cyanotic with faint pulse and recovered at once after the administration of magnesium sulphate. These toxic phenomena are ascribed to the liberation of nitrous oxide or a similar gas into the blood through the decomposition of the bismuth salt.

In exceptional cases in which there is a marked degree of emaciation and exhaustion, open caecostomy, as performed by HERRICK, is advocated.

The case mortality of treated cases was 5·4 per cent. Out of the 66 cases whose subsequent records could be traced three, or 4·5 per cent., relapsed after bismuth subnitrate treatment; similarly metastatic hepatic abscesses were very rare.

The frequency of abscess in the liver and its comparative absence in other organs, save when secondarily infected from the liver, can best be explained on the theory that in the liver cell a medium suitable for the development of the entamoebae is elaborated, while in the intestines these organisms are apparently symbiotic with micro-organisms.

Bacillary Dysentery.—Only four positive cases, that is cases in which a definite dysentery bacillus—the Y bacillus—was isolated, have been noted. In one the organism was recovered by DARLING and BATES in a blood culture four days before death.

The patients suffering from this form were more prostrate than the ordinary amoebic cases. The temperature was higher and the stools contained more blood.

The best results in treatment were obtained from the use of opiates after a preliminary dose of calomel or salts, or castor oil. The beneficial action of the opiates is ascribed to the lessening of peristalsis and of consequent dissemination of the organisms into the deeper tissues.

One autopsy showed shallow, coin-shaped ulcers in the colon, appendix and small intestines, and also in the sigmoid colon where a perforation had taken place. The heart valves showed acute and chronic endocarditis; there was also acute nephritis, multiple splenic infarcts, and acute lymphadenitis of the mesenteric, mesocolic, inguinal and femoral glands. [All these different lesions are ascribed to the action of the dysentery bacillus, though there appears to be little or no evidence of this origin.]

Bilharzia dysentery.—During 1911 three cases of [presumably rectal] bilharzia infection were admitted to Ancon hospital, and during 1912 six who passed blood and pus in their stools. One died after five and a half months in hospital unrelieved by any remedy. At the autopsy, which has already been reported by Dr. S. T. DARLING, the large intestine and especially the rectum were ulcerated and thickened and riddled with suppurating sinuses, one of which had perforated and set up a general purulent peritonitis.

Balantidium dysentery.—In Ancon hospital ten to fifteen cases of balantidial infection of the stools are met with yearly and may or may not be associated with dysenteric symptoms. No pathogenic properties are ascribed by Deeks to this organism and no cases in which it occurred have proved fatal.

Malarial dysentery.—During the years 1911 and 1912 twenty-four cases occurred; all recovered on quinine treatment.

Tubercular dysentery.—This may occur in the course of a general tubercular infection or the ulceration may be limited to some part of the intestinal tract. The diagnosis can only be made on the persistence of symptoms and on the presence of acid-fast bacilli in the stools.

Nephritic dysentery.—During the past year there were twenty-five admissions to Ancon hospital with five deaths from this type of dysentery; two were associated with acute, three with chronic nephritis.

Clinically the cases which are associated with acute nephritis are very asthenic, toxic in appearance, and run a normal or subnormal temperature. The abdomen is retracted, the bowel not perceptibly thickened and the skin inelastic; the watery stools are numerous and contain much blood.

As a general rule the patients recover without much permanent renal damage resulting. The etiology is obscure, though in some the condition seems to bear a definite relation to malarial infection. It may be, the author suggests, that an unsuitable sweet carbohydrate diet is a determining factor. Pathologically the ulcerative lesions are not confined to the caecum and colon, but may involve the small intestine as well. In treatment frequent administrations of magnesium sulphate gave the best results.

Diphtheritic colitis.—Four deaths occurred from this disease in the years 1911 and 1912. At the autopsy a grey slough covers practically the whole of the mucous membrane of the large and a small part of the adjacent small intestine. No cultures have been made to determine the causative organism. The condition is apparently always fatal. Clinically the patients show extreme prostration with high fever and frequent bloody motions.

Dysentery in the course of pellagra.—Nearly every one of the seventeen admissions for pellagra exhibited dysenteric symptoms. Out of five fatal cases, only three showed ulceration of the bowel. A carbohydrate-free diet with dilute nitric acid between meals brought about a speedy convalescence.

Dysenteries resulting from the ingestion of decomposing meat, fish, milk, etc.—After the ingestion of decomposing proteids a severe and fatal enterocolitis results, due probably to *Proteus vulgaris*, *B. coli*, *B. enteritidis* and allied organisms.

[Certain warrantable criticisms may be launched at the latter part of this paper. There is little to show, in view of the incompleteness of the bacteriological examination of dejecta and post mortem material, which the author admits, that the so-called nephritic dysentery, diphtheritic colitis, the dysentery occurring in the course of pellagra, food poisoning, and heart disease are not, so far from representing distinct types, due etiologically to the same organism, *Bacillus dysenteriae*, which, as is well known, too often occurs as a terminal infection in the course of some other chronic debilitating disease. There also appears to be little justification for making generalised statements with regard to the differentiation of amoebic and bacillary infections from the macroscopic appearance of the stools and of the lesions post mortem, arguing from such a small series of cases. These may vary indefinitely according to the site and severity of the lesions in any given case.] P. H. B.

Martini. **Ueber Ruhr im Deutschen Schutzgebiet Kiautschou und in Schantung.** [Dysentery in the German Protectorate of Kiao-Chau.]—*Jl. of State Med.* 1914. June. Vol. 22. No. 6. pp. 356-359.

A summary of work done in the bacteriological laboratory at Kiao-Chau during the years 1908-09-10, on the organisms causing the local forms of dysentery. *Entamoeba histolytica* was the sole cause of amoebic dysentery, and was isolated in from 25 to 30 cases in each year. For bacillary dysentery, figures can be given for the year 1910 only, owing to want of a proper supply of reliable sera in previous years; B. Shiga-Kruse was isolated eight times, B. Flexner seven times and the Y bacillus nineteen times.

S. R. D.

Libieratos (S. G.). Ἡ ἐπιδημικὴ δυσεντερία [Epidemic Dysentery].—Ἀρχεῖα Ἰατρικῆς [*Archives de Médecine.*] 1914. May 1-10. Vol. 9. Nos. 13 & 14. pp. 129-144, and No. 15. May 20. pp. 150-153.

A lecture on dysentery, of a purely didactic character, delivered to an audience of army surgeons by Professor Libieratos. While summarizing the whole subject in a very masterly manner, it does not apparently pretend to add anything original to our knowledge of the diseases comprised under this heading, and therefore need not be analysed at length.

J. B. N.

Hornus (P.). **Note sur les Dysenteries observées dans la Région de Fez.**—*Arch. de Méd. et de Pharm. Militaires.* 1914. July. Vol. 64. No. 7. pp. 1-17. With 2 curves.

From August 20th–November 20th, 1913, the author treated nearly 200 cases of dysentery in Morocco (122 of amoebic and 78 of bacillary origin).

[The differential diagnosis of the two forms of the disease appears to have been made on the macroscopical appearances of the stool as well as on the clinical symptoms and history of the patient. Every worker on this group of diseases recognizes how utterly fallacious are macroscopic observations for differential diagnosis unless carefully confirmed by laboratory tests.]

P. H. B.

i. Seyffert. **Bericht über Uzara bei Amöbenruhr.** [Report on Uzara in Amoebic dysentery].—*Arch. f. Schiffs- u. Trop.-Hyg.* 1914. June. Vol. 18. No. 12. pp. 415-421.

ii. Linsker (J.). **Ueber erfolgreiche Anwendung von Uzara bei der Ruhrepidemie in Uhelna Bezirk Stryj.** [On the Successful Employment of Uzara in an Epidemic of Dysentery at Uhelna (Galicia).]—*Med. Klinik.* 1914. May 31. Vol. 10. No. 22. pp. 937-938.

i. A report on the cases of six native policemen treated in the native hospital at Aruscha, German East Africa, with Uzara.

The author's conclusion is that Uzara is a drug which has a prompt remedial action in cases of acute amoebic dysentery. It combats the toxic action of the amoebae, reducing both colic and diarrhoea ; but it cannot be called amoebicidal, and is therefore comparatively useless in the chronic forms of the disease.

ii. The author employed Uzara, chiefly in the form of the liquor supplied by the makers, in 80 cases of bacillary dysentery, after trying other remedies with poor results, and speaks very highly of its action. Of the 80 cases, 50 were in children and the remainder in adults. The dose of the liquor given ranged from 5 to 30 drops three times daily.

S. R. D.

CHOLERA.

Simond (P. L.) & Pasteur Vallery-Radot avec la Collaboration de Kiamil Bey & Asseo (Raphaël). **Notes sur le Choléra à Constantinople et en Thrace, de 1910 à 1913.** *Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 313-357. With 1 plate, 1 map & 1 text fig.

From the 13th September to the 31st December, 1910, 1,284 cases of cholera occurred in Constantinople and its environs; of these 753 died. In 1911 the cases were few, while again in 1912 from November 5th to December 31st, 2,260 cases occurred, with 1,123 deaths. In 1913 a further small recrudescence of the disease occurred, during which an epidemic of 14 cases occurred in an asylum.

The water of the city is drawn from various sources, one being the lake of Derkos and another the forest of Belgrade. The district of Derkos was early infected with cholera, but the water from the lake was never shown bacteriologically to be specifically contaminated. Both water supplies were badly distributed, however, and showed a high bacterial count. From a consideration of the distribution and occurrence of the cases, water could be definitely excluded as playing any part in producing any of the epidemics. Contact with patients, infected objects, soil and excreta were the essential causes at work. The authors describe the disease as being essentially associated with dirty hands. A marked lowering of the temperature was on several occasions associated with the cessation of an epidemic, but whether this acted directly on the organism outside the body or indirectly through its effect on carriage of infection by flies was not determined.

The contagion was brought to Constantinople usually by fugitives or soldiers returning from infected areas in Thrace. It was taken to Thrace by the troops sent to the front from Anatolia. In October 1912 cases occurred in the regiments of the Turkish army situated at Lule Burgas and, in the retreat which followed the Bulgarian attack, the disease increased so that from the 20th to the 30th November several thousand new cases appeared daily.

The bacteriological examination of the faeces revealed many spiral forms in association with the cholera vibrio, but since these forms are also present in amoebic dysentery the authors suggest they are saprophytes of the intestine and of no great importance. 2,669 contacts were examined for vibrios and 63 of them were found to be carriers.

A table is given showing the average titre of patients' serum in positive cases from the first to the 53rd day, from which it appears that the average titre is very variable and erratic.

Several erythematous rashes were seen during the epidemics; they occurred in the stage of reaction and were usually (77 per cent.) morbilliform in character, though scarlatiniform, purpuric, papular and polymorphic eruptions were also met with. They commenced generally on the arms and generalised in 24 to 48 hours. They were red on first appearing and became violet by the third to fifth day of their existence and finally a little brownish. Desquamation occurs. 25 per cent. of the cases with morbilliform eruption died.

W. J. Penfold.

Eckert. **Die Rolle der Kontaktinfektion in der Epidemiologie der Cholera. (Nach in Bulgarien gesammelten Erfahrungen).** [Contact Infection in the Epidemiology of Cholera].—*Berlin. Klin. Wochenschr.* 1913. Dec. 15. Vol. 50. No. 50. pp. 2326–2328.

The author was engaged last year in a cholera hospital in Sophia and formed one of a mission of four German doctors engaged by the Bulgarian Government for anti-cholera work. The explosive outbreak of cholera in the Bulgarian army at Tschataldscha appears to have been a chief cause of the arrest of the Bulgarian advance.

The incidence of the disease in the army of Bulgaria has been variously stated at from 16,000 to 29,600 cases with 6·2 per cent. of deaths. The main cause of the spread of the infection was the neglect of the recruits to use the latrines provided in the camps; they contaminated the ground throughout the camps with dejecta and in removing their shoes and clothing the hands were infected. Washing seems to have been a luxury in the camps. In this way a contact infection (in the wide sense) of large numbers of men in an explosive manner occurred. Water infection did not appear to play a part in the spread of the epidemic.

The army when transferred through Macedonia to fight against the Serbs and Greeks infected the country in its passage. Owing to the army's close proximity to Sophia and to the large number (40,000) of Macedonian refugees accumulating in the latter the capital became infected. Sophia is efficiently sewered and has an excellent water supply from the neighbouring hills. It is exceedingly clean. Up to the end of September 800 cases of cholera had been diagnosed in the town, but the great majority of them were imported and owing to the good hygienic conditions obtaining in the town no marked tendency to local spread of the disease developed. Contact infection was not observed amongst the personnel of the cholera hospital at Sophia. The apparent contradiction between the importance of contact infection at Tschataldscha and its unimportance in Sophia is explained probably by quantitative considerations. In Sophia, owing to good hygienic conditions, doses of virus would be relatively small and therefore ineffective, while at Tschataldscha the converse would hold.

W. J. P.

Babes (V.). **Studien über Cholerabekämpfung.** [Studies on the Control of Cholera.]—*Zeitschr. f. Hyg.-u. Infektionskr.* 1914. May 27. Vol. 77. No. 3. pp. 501-533.

The author assisted in the anti-cholera campaign (1913) in the Bulgarian territory occupied by the Roumanians. Many of his conclusions as to the relative merits of different factors in the campaign are not absolutely proved, but must be rather looked on as impressions derived, after considering the local circumstances, from a large number of more or less independent observations.

The vaccination of the civil population against cholera was undoubtedly effective. To obtain the best results large doses of vaccine were required, vaccination had to be repeated, and it had to be widespread.

Vaccination with one dose appeared to predispose to attack during the two days immediately succeeding it. During the 8-10 next following days marked immunity resulted, after which occasional cases again occurred. In the first days after the second dose of vaccine occasional cases of cholera arose, but practically none later.

Vaccination appeared useless in the treatment of carriers. Carriers did not subsequently develop the disease itself. Cholera vaccine in treatment did not favourably influence the mortality, though it promoted diuresis and improved the general condition of the patient. The author tested a number of cholera strains as to their ability to produce severe reactions and also to call forth large quantities of protective substances. The strain giving the least reaction and most protection was fixed on for the vaccine. The author is opposed to polyvalent vaccines in the case of the *V. cholerae* or *B. typhosus*.

The method used for the quick identification of the *V. cholerae* was as follows. The material was grown 4 hours in alkaline peptone water, then subcultured on to agar, on which it was allowed to grow for 6 hours, then agglutination tests were applied. The diagnosis required 11 hours. Of the carriers discovered 95 per cent. did not carry more than 4 days after their discovery. Not one of them subsequently took cholera, nor was there much evidence that they spread the disease. Many cases occurred in which individuals free from the specific germs on one day, as far as could be ascertained by the examination of excreta, showed the disease the next day. The author believes the incubation period of cholera to be 1–2 days, not 5 days as frequently stated. Infected water was frequently shown to cause local outbreaks of cholera.

W. J. P.

Castelli (A.). **L'Epidemia Colerica del 1912 nella Provincia di Cagliari [Sardinia].**—*Annali d'Igiene Sperimentale.* 1914. Vol. 24. (Nuova serie.) No. 2. pp. 245-268. With 4 figs. and a chart.

The epidemic lasted from the 4th of August to the 27th October. The bulk of the cases were in the city. The cause of the epidemic was obscure, but it seemed probable that it was related to that of the previous year, the virus being dormant during the intervening months. The foci in the city were four in number. No quarter was entirely free. 4,089 examinations of material were made by the Communal laboratory.

The city had a total of 100 cases during the epidemic, of which 61 were notified in the ordinary way, 12 were recognised in hospital, and 27 were only recognised post mortem ; 49, 37, and 14 were the numbers of cases occurring in the months of August, September and October respectively. Of these cases 55 proved fatal. One hundred and seven carriers were discovered, of whom 28 suffered from a slight diarrhoea with no other symptoms. Cholera affected females more than males. The males were more affected in infancy and the females in the age period 20–40 years.

The vibrio was recovered up to the 36th day in the case of actual patients and up to the 16th day in the case of carriers, but usually it persisted only about four days. In the province outside the city only ten cases occurred, and the infection in them was traceable usually to the city cases.

The bacteriological technique and results were in no way remarkable. Two non-agglutinating vibrios were isolated which did not acquire agglutinating properties, though treated in various ways which have been shown to restore agglutinating power. In the cholera cases which were not very grave the agglutinating titre of the patients' serum reacted from 1–100 to 1–1,000. W. J. P.

Sergent (Edm.) & Nègre (L.). **Recherches des Bacilles Dysentériques et des Vibrions Cholériques dans les Selles de Pèlerins Musulmans Nord-Africains revenant de la Mecque, Sains en Apparance.**—*Compt. Rend. Soc. Biol.* 1914. June 19. Vol. 77. No. 21. pp. 104–106.

In search for the *V. cholerae* the authors examined the stools of 67 pilgrims returning to North Africa from Mecca and found three of them to contain vibrios. Two of these grew on peptone water, potato and gelatine as the *V. cholerae* and also agglutinated with a specific serum to 1–2,000 dilution. They gave Pfeiffer's reaction and were not haemolytic to sheeps' red cells. They gave the cholera red reaction. The other vibrio was strongly haemolytic; it did not agglutinate nor give Pfeiffer's reaction. The danger of these carriers from the public health standpoint is pointed out.

The same patients were examined for dysentery carriage; these results are summarised on page 312. W. J. P.

Barber (M. A.). **Cockroaches and Ants as Carriers of the Vibrios of Asiatic Cholera.**—*Philippine Jl. of Science.* Sect. B. Trop. Med. 1914. Feb. Vol. 9. No. 1. pp. 1—4.

The fact that cockroaches are liable to become contaminated with human faeces and to creep over human food, depositing their faeces upon it, suggested to the author that they might be cholera carriers, and he determined to test this view.

The species used was *Periplaneta americana*, and all were winged adults. Hungry insects were fed on cultures or on faeces from human cases. The insects fed on cholera faeces showed specific vibrios in the stools in from 6 to 79 hours after feeding. They were often present in enormous numbers in an actively motile state. In some cases the vibrios disappeared from the insect's faeces in about thirty hours from the time of feeding; at other times they persisted for some time. A series of results is given dealing with the longevity of the cholera germs of human and insect faeces when placed on different varieties of foods. The cockroaches were liable to vomit, and the vomited matter was found to contain living vibrios up to one hour after feeding. The vibrio does not lose its virulence for the guinea-pig by passage through the gut of the cockroach. Evidence is brought forward that red ants (*Monomorium latinode*, Mayr) are probably also efficient carriers of cholera.

W. J. P.

Cremonese (Guido). **Un Segno Clinico Patognomonico del Colera Asiatico.** [A Clinical Sign Pathognomonic of Asiatic Cholera.]—*Policlinico.* Sez. pratica. 1914. May 31. Vol. 21. No. 22. pp. 784-785.

The author had experience of cholera in the province of Rome in 1911. The short note describes three facial appearances in cholera patients.

1. An earthy appearance of the face.
2. A lividity around the eyes, especially below the lower lid. This is more constant than sign 1, but is observed also in non-cholera diarrhoea.
3. A brilliant white pearly colour of the eyelids, especially of the lower, making the eyes appear large and bright. The author believes this appearance of the eyes characteristic of cholera. It is most valuable in the initial stages, but not as reliable in advanced cases.

W. J. P.

Cadbury (Wm. W.) & Hofmann (J. Allen). **Epidemic Cholera in Canton, China.**—*China Med. Jl.* 1914. May. Vol. 28. No. 3. pp. 165-172.

The paper gives the results of treating cholera in lunatic patients with Rogers's hypertonic saline injections. The patients were lying on the floor and all apparatus used was improvised; nevertheless, the results were exceedingly good. Six to ten litres were injected in the course of the treatment of any one case. The indication that enough had been given was the flow of fluid from the mouth and rectum. If in spite of the injection the blood pressure remained below 95 mm. of mercury and the urine was scanty, then the patient invariably died. Of 27 patients transfused 74 per cent. recovered; of 17 patients not transfused only 35 per cent. recovered and it must be noted that several of these were not transfused because the attacks appeared mild. The chief causes of death were collapse and uraemia. A table is given showing the mental state of the patients, number of transfusions and duration of the illness.

W. J. P.

Dubalen. **Adrénaline et Choléra. Extrait du Rapport Annuel de 1912 de la Province de Soairing (Cochinchine).** [Clinique d'Outre-Mer.]—*Ann. d'Hyg. et Méd. Colon.* 1914. Apr.-May-June. Vol. 17. No. 2. pp. 590-592.

Adrenalin treatment gave, in the hands of the Tunisian physician who advised it, 100 per cent. of recoveries in 20 cases treated. The author of the present note treated 166 cases thus and had 43 deaths, 26 per cent. In a control series of 1,115 treated by ordinary methods no fewer than 69 per cent. died. In neither series was hypertonic saline or anticholera serum used. The dose of adrenalin given was 2 mgm. intravenously or 3–5 mgm. subcutaneously. Theoretical considerations which suggested that the treatment might be of value are discussed.

W. J. P.

Sellards (Andrew Watson). **The Relationship of the Renal Lesions of Asiatic Cholera to the Ordinary Nephritides with Especial Reference to Acidosis**—*Amer. Jl. Trop. Diseases & Prevent. Med.* 1914. Aug. Vol. 2. No. 2. pp. 104-116.

The increase of tolerance of the body to bicarbonate, found in the uraemia of cholera, is also present in nephritis from other causes. The author attributes this increased tolerance to acidosis, and discusses the causes of the acidosis at some length, without however producing any new experimental work on the subject. The causes of increased excretion of ammonia in cholera are also discussed. The results obtained at Manila by treating cholera cases with intravenous injections of sodium bicarbonate and acetate solutions are set out in tables. These show that deaths from uraemia are almost entirely avoided by this method of treatment.

The author recommends intravenous injections of a half per cent. sodium bicarbonate solution given in saline in quantities of two litres. This is to be repeated until the urine becomes alkaline or polyuria develops. The author finds that 100 grams of bicarbonate may be required in two or three days. The solution should be sterilised in tightly stoppered bottles in an atmosphere of carbon dioxide and kept stoppered till ready for use. It is also possible to get fresh stocks of pure bicarbonate in small sterile containers ; these can be used without sterilisation.

W. J. P.

Savas (C.). **Ueber die Choleraschutzimpfung in Griechenland.** [Cholera Immunization in Greece.]—*Wiener Klin. Wochenschr.* 1914. July 23. Vol. 27. No. 30. pp. 1093-1098.

This paper gives the results obtained from vaccinating about half a million people in Greece—soldiers, civilians and refugees. During the Greco-Turkish war no cholera occurred in the Greek army, but in the Greco-Bulgarian war, on the other hand, cholera was very prevalent. The total number of cases in the army and amongst the Greek civil population was about 5,700, of which 1,700 were fatal.

The vaccine used was made according to the method of Kolle, and where possible two doses were given. The vaccination diminished the incidence of the disease greatly. Of 114,803 soldiers 8,968 were not inoculated, 14,613 were inoculated once and 91,224 were inoculated twice. The incidence of the disease amongst the uninoculated was 93 per thousand, amongst those inoculated once 42 per thousand and amongst those inoculated twice 7 per thousand. Separate figures dealing with the incidence of the disease amongst the attendants and nurses of cholera patients give similar results.

Amongst the cholera-infected it was found that the mortality of the unvaccinated was 27·5 per cent., among those vaccinated once only 12·2 per cent., and of those vaccinated twice it was 10·2 per cent. The general impression obtained by the doctors dealing with the civil population was similar to the statistical results carefully collected by the medical staff of the army.

W. J. P

Cardamatis (J.). Τὰ πεπραγμένα ἐπὶ τῆς ἐν Μακεδονία χολέρας κατὰ τὸν Ἑλληνο-βουλγαρικὸν πόλεμον. [The Measures taken against Cholera in Macedonia during the Graeco-Bulgarian War.]—Ἰατρικὴ Πρόοδος. [*La Grèce Médicale.*] 1914. Mar. 1-15. Vol. 19. Nos. 5-6. pp. 91-98.

The author gives an account in this paper of the measures taken by the Greek authorities to prevent the spread of cholera in Southern Macedonia after the retreat of the Bulgarian army. Besides the usual steps with regard to disinfection and the care and isolation of the sick, for which the services of the local medical practitioners were enlisted, a special staff of eight medical officers was told off to vaccinate compulsorily the whole population with cholera vaccine. Previous to the arrival of the commission in the district there had been about 450 cases of cholera with 260 deaths, but the figures were difficult to obtain with exactitude. By the time the whole of a population of 50,000 persons had received two inoculations apiece, and in some cases three, the disease had disappeared, and the author is disposed to attribute this result in great measure to the compulsory inoculation.

The vaccines used were obtained from different sources, and the doses used ranged from one-sixth of a gramme for a child of three months old to half a gramme for an adult, the interval of time between the two doses varying from 6 to 30 days, according to circumstances. The place of injection as a rule was the outer and posterior aspect of the upper part of the left arm, but in the case of a certain number of Mohammedan women the injection was made into the forearm. Considerable reaction, with nausea and transient fever, occurred in nearly all the cases. Patients suffering from acute diseases and those with heart or kidney disease were exempted from inoculation. The seat of injection was always first washed with soap and water and then dried with alcohol, or else painted with iodine, and the needles of the syringes, in order to save time, instead of being boiled after each injection, were wiped with a plug of cotton wool dipped in alcohol. Not a single case of suppuration was noticed. In malarial patients, the inoculations seemed to precipitate febrile attacks, but in children suffering from such diseases as measles and whooping-cough no effect upon the course of the disease was observed.

By means of judicious addresses to the assembled villagers and lectures on the subject of cholera to the more educated inhabitants of the various districts, resort to the provisions of military law was almost entirely avoided. J. B. Nias.

Cardamatis (Jean P.). **Rapport sur la Lutte contre le Choléra en Macédonie pendant la Guerre Greco-Bulgare.** - *Bull. Soc. Path. Exot.* 1914. May. Vol. 7. No. 5. pp. 447-459.

Anticholera vaccination was largely used by the author and his assistants in Macedonia. The vaccines used were obtained from Germany and Switzerland at the commencement of the campaign, but later on from Athens only. The dose for adults was 0·75 cc. on the first occasion, 1·5 cc. on the second occasion. The vaccination was compulsory from the age of three months upwards. Over 100,000 vaccinations were done and no case of suppuration occurred. Syringe needles were not boiled between injections but simply wiped with cotton wool soaked in alcohol.

The plan of campaign in a village was as follows :—A general meeting was called of all inhabitants, the priest and other chief men of a village being held responsible for the completeness of the meeting. A lecture was then given on the nature and transmission of the disease, on the methods of sanitation, on the penalties incurred by those who concealed cholera cases or cholera infected clothing, etc., on the value and compulsory character of anticholera vaccination and on the treatment of the disease.

A commission of hygiene of each village was appointed which exercised the usual powers of a public health authority. The doctors of each locality were assembled separately and districts for vaccinations were assigned to them and all information as to treatment of cases, disinfection and the like given to them. The immediate after effects of the vaccination were as a rule trifling ; 15 per cent. however had feverish attacks and 5 per cent. had diarrhoea. A large number, 41 per cent., had slight local pain. A few cases of nettle rash were seen following the injections. Tables are given suggesting that the vaccination reduced the incidence of the disease and the mortality from it, but they are not above criticism. Tables are given showing the effect of vaccination during and just before menstruation.

W. J. P.

Slatineano (A.) & Mihaïesti (C. J.). **Note sur la Vaccination Anticholérique. Absence de Sensibilisation.**—*Compt. Rend. Soc. Biol.* 1914. May 8. Vol. 76. No. 15. pp. 698-699.

The authors believe, from their work with the Roumanian army, that the vaccination of carriers of cholera germs is quite safe.

In their first series 250 carriers were vaccinated. They received two doses, 3 and 5 cc. respectively, with an interval of five days between the doses. The injections were always given intramuscularly. The carriers reacted to the vaccine with local pain and transient fever and general malaise exactly as the normal controls. No vomiting or diarrhoea resulted from the vaccination. A second series of 125 carriers gave the same result.

The average duration of the carrier state in these cases was two to four weeks.

W. J. P.

Balteano (J.) & Lupu (M.). i. **Recherches Expérimentales, chez l'Homme, sur la Production des Agglutinines et des Précipitines dans le Sang des Individus vaccinés contre le Choléra.**—*Compt. Rend. Soc. Biol.* 1914. May 1. Vol. 76. No. 14. pp. 680-682. With 1 curve.

ii. **Bactériolysines et Sensibilisatrices du Sang après la Vaccination Anticholérique.**—*Ibid.* pp. 683-684. With 2 curves.

iii. **Symptomatologie des Vaccinations Anticholériques.**—*Ibid.* June 26. Vol. 77. No. 22. pp. 174-176. With a chart.

i. The authors vaccinated with a Kolle vaccine three groups of individuals

The first group of two persons had one dose of vaccine. The second group of four persons had each two doses, and the third group of four persons had three doses each. The interval between injections was seven days. In six of the ten persons the normal serum agglutinated the specific vibrio in 1/10 dilution. In those having one injection an agglutinin titre of 1/20 occurred after 24 hours, three days later it fell to 1/10 and then after 48 hours commenced to rise again to attain its maximum on the 24th day (1 130). It then very gradually fell. The serum of individuals with two or three injections obtained a slightly higher agglutinating titre (1 150), and it remained high for seven days and then commenced to fall.

The precipitin content of the patients' serum varied exactly as the agglutinin content. No negative phase appeared after the second or third injections in any case.

ii. The lysin was tested for by the *in vitro* method. The mixture of inactive serum, antigen and complement was allowed to stand one hour in the incubator at 37° C. In individuals receiving one injection the lysin appeared four days after inoculation and attained its maximum after 56 days. The rise was not uniform during the interval; an actual fall in bacteriolytic power occurred about the 20th to the 30th day. The bacteriolytic titre was found to have remained high three months after the inoculation had been made. In the case of the individuals receiving multiple doses the content of lysin increased more quickly, attained a greater height and kept up longer. In the case of the complement fixing amboceptor as studied by Bordet-Gengou's reaction, the curve was entirely different. In the case of patients receiving one dose of vaccine the amboceptor content of the serum reached its maximum after eleven days from the time of infection, and after remaining high for five days rapidly fell.

iii. The vaccine was always given into the triceps. Heaviness and pain in the limb supervened in three or four hours and movements of the shoulder joint became difficult. These symptoms attained their maximum at the eighth hour and disappeared in 24 hours. Oedema and redness appeared at the point of inoculation. Local suppuration never occurred, but slight axillary adenitis was common. Three to four hours after vaccination a fever reaction set in and attained its maximum about the tenth hour. It rarely exceeded 39° C. Polyuria frequently followed the vaccine while anuria was rare. Ten cases had the urine regularly examined and showed no albuminuria or casts. One person, however, the subject of chronic nephritis, died of uraemia on the sixth day after injection. Diarrhoea is not infrequent after cholera vaccination; sometimes nausea occurs and even vomiting.

Cholera vaccination occasionally lights up old rheumatic mischief in joints. A polynuclear leucocytosis was found to follow each dose of vaccine. The reaction in children is slight. Two women succumbed to cholera shortly after vaccination. The cholera started in one case four, and in the other six, hours after the administration of the vaccine.

W. J. P.

Cicconardi (Giuseppe). **Modificazioni funzionali prodotte dalle Tossina Colerica sui Vari Sistemi dell'Organismo.** [The Effect of Cholera Toxin on the Bodily Functions.]—145 pp. With 32 figs. Napoli: Stab. Tip. Francesco Lubrano. Summarised in *Sperimentale.* 1914. Mar. 30. Vol. 68. No. 1. pp. 69-116.

The author, working in Galeotti's laboratory, Naples, has studied the effect of cholera toxin on the organism, and has come to the conclusion that all the clinical manifestations of the disease can be fully explained on the ground that they are due to the toxin. The toxin he used was the toxic nucleo-proteid prepared by a method similar to that used by Galeotti in his study of plague intoxication. The cholera strain used was virulent to guinea-pigs. It was grown in broth in 300 cc. quantities for fourteen days at 37° C. A minimal lethal dose of the toxin was difficult to determine, but a few milligrammes killed rabbits of middle weight. The death occurred rapidly on intravenous injection, slowly on intraperitoneal injection. The power of the toxin in lowering the temperature of the animal was very marked, 28° C. being registered before death in the case of the rabbit. Guinea-pigs were less affected in this way. The toxin causes convulsions in the later stages, and during this time the temperature rises. When the temperature is falling the heat given out by the animal is also markedly diminished, so that the heat production is evidently at fault.

The cholera toxin has a marked action on the isolated heart; it causes sudden slowing of the beat and irregularity. The force of the heart may not be immediately diminished, but may, on the other hand, be augmented. The ventricles usually cease to contract before the auricles. Death of the heart occurs about half-an-hour after the toxin is added to it. The toxin appears to affect the nervous mechanism of the heart rather than its muscular fibres. The toxin causes in the rabbit a marked fall of blood pressure and slowing of the pulse. The respiratory rate during this time may be increased or diminished. Attempts were made to determine the action of the toxin on the arteries of the ox, but the results were not decisive. The blood changes produced in the rabbit by the toxin are not very marked. Slight apparent increase of reds occurs, due to peripheral stasis. Leucocytosis occurs. The polymorphs are increased, and in one case an intense eosinophilia was observed. Hurried, laboured respiration occurred under the influence of the toxin, and also different types of irregular breathing. Respiratory paralysis frequently caused death. The action of the toxin on the kidney vessels depends on the dose, and the suppression of urine does not appear to be secondary to the action on the vessels. The cholera toxin augments the peristalsis of the gut. The investigation suggested that all the clinical features of the disease may be reasonably explained by believing it to be an intoxication with this nucleo-protein.

W. J. P.

Violle (H.). **Sur la Pathogénie du Choléra.**—*Compt. Rend. Acad. Sciences.* 1914. June 8. Vol. 158. No. 23. pp. 1710-1711.

The author brings forward experimental facts to show that diminution of the bile plays an important part in the production of cholera.

He experimented on rabbits and dogs, and the chief results are as follows.—

Cholera culture introduced directly into the intestine does not cause cholera.

Cholera injections after augmenting or diminishing the pancreatic juice in the intestine are also ineffective in causing cholera.

If, on the other hand, the common bile duct be tied and cholera culture in small doses be injected into the intestine below the entrance of the pancreatic duct, typical cholera results. If the common bile duct be tied and immediately below its entrance into the gut cholera culture be injected, cholera does not result.

In the case of animals which took the disease from the use of the above described successful method (eight out of nine) the typical post mortem appearances of cholera were present.

Cholera toxin, injected intravenously, diminished the secretion of bile. The author finds that a preliminary dose of such toxin, followed by inoculation of cholera culture directly into the gut below the entrance of the pancreatic duct, causes cholera. He concludes that the bile is a natural protection of the body against cholera.

W. J. P.

Nasta (M.). **Choléra Expérimental chez des Cobayes ayant reçu préalablement une Injection de Sérum Entérolytique.**—*Compt. Rend. Soc. Biol.* 1914. June 26. Vol. 77. No. 22. pp. 177-178.

The mucous membrane of guinea-pig small intestine was washed and emulsified in isotonic saline. This emulsion was injected subcutaneously into a rabbit. Six injections were given at intervals of a week. The serum so obtained was slightly haemolytic and caused slight bloody diarrhoea when injected intraperitoneally into guinea-pigs. To healthy guinea-pigs a preliminary dose of this enterolytic serum was given, followed in two hours by cholera culture. No alkali was given to the animal. Marked falls of temperature followed with death in 20 to 36 hours. The experiments were done in fasting animals.

Post mortem the typical appearances of cholera were found.

W. J. P.

Goldberger (Joseph). **Some New Cholera Selective Media.**—*Treasury Dept. U.S. Public Health Service, Hygienic Laboratory Bull.* No. 91. 1913. Dec. pp. 19-39.

The paper is introduced by a useful summary of the literature dealing with selective cholera media. The alkaline peptone agar of Crendiropoulo and Panayotatou was found by the author to have little restraining effect on ordinary faecal bacteria. The alkaline egg peptone agar of Krumwiede, Pratt and Grund was found to restrain not only the ordinary faecal bacteria, but also the *V. cholerae* itself, so that disappointing results were obtained with it. Goldberger, however, confirmed the fact that the cholera organism grows on the egg medium with a very characteristic hazy appearance. He therefore tried to modify the K. P. G. egg medium so as to retain the distinctive appearance of the colony and at the same time make it highly selective. His best modification was obtained by mixing in suitable proportion

alkaline egg solution with meat extract glucose agar. This mixture restrains ordinary faecal bacteria very well, though *B. pyocyaneus* and *B. faecalis alkaligenes* are fairly resistant to its inhibitory action. The *V. cholerae* and some non-cholera vibrios grow exceedingly well on it. A medium in which the egg solution was replaced by alkaline meat infusion gave almost identical results. The author also introduces a new enrichment solution. This is kept in two fractions and mixed as required: (a) alkaline-egg solution, (b) peptone water. This enrichment medium restrains the *V. cholerae* a little, but the other intestinal bacteria very markedly, so that it is altogether more effective than the usual peptone water enrichment method. It is unsuitable for the recovery of the *V. cholerae* from sewage, as members of the Proteus group present overgrow the cholera germ.

W. J. P.

Fügner (Ignaz). **Ueber den modifizierten Dieudonnéschen Choleranährboden von Hoffer und Hovorka.** [The Modified Dieudonné Culture Medium of Hoffer and Hovorka.]—*Centralbl. f. Bakt.* 1. Abt. Orig. 1914. June 13. Vol. 74. No. 3/4. pp. 354–365.

On preliminary testing of the Hoffer-Hovorka medium Fügner found that it was extremely antagonistic to laboratory cholera strains. After much trouble he showed this to be due to the fact that the crystal violet alkaline blood agar had not been boiled before the plates were poured. After a preliminary boiling for 15–20 minutes the medium gave excellent results. Cholera strains were a little more inhibited by it than by Dieudonné's medium, but non-cholera organisms in general were much more inhibited by it than by Dieudonné's medium.

Stools from a case of febrile enteritis had varying quantities of cholera culture added to them and comparative platings on Dieudonné's and on the Hoffer-Hovorka media were made. In 62 comparative experiments Dieudonné's plates gave 33 successes, while the Hoffer-Hovorka plates gave 60 successes. The cholera colonies on this new medium are very easily recognised owing to the complete or almost complete suppression of other bacteria. The agar for this new medium must be used fairly fresh. The chief defect of the Hoffer-Hovorka medium is that it cannot be used immediately after pouring the plates, but must, like Dieudonné's, be kept for some time. Attempts to do away with this difficulty by the addition of lactic acid were not successful.

W. J. P.

Popoff-Tcherkasky (Dora). **Quelques Observations sur la Morphologie et la Biologie du *V. cholerae* (Koch) Buchner isolé pendant la Guerre des Balkans.**—*Centralbl. f. Bakt.* 1. Abt. Orig. 1914. July 16. Vol. 74. No. 5/6. pp. 382-392. With 1 text fig.

The author examined (1912–1914) 37 strains of *V. cholerae* isolated in Sophia from the faeces of Bulgarian or Turkish soldiers. The method of isolation employed showed nothing new. Dieudonné's medium appeared to be valuable.

The agglutination test was applied to the cultures on the 18-hour old Dieudonné plates. The cultures obtained were examined again after six to eleven months and no variations of the agglutination

character were found. The morphology of the organisms on isolation was fairly constant, a short stumpy rod, very slightly curved, the middle portion thick with extremities pointed or rounded. Four to nine months after isolation many involution forms appeared, micrococci, spirals, globose swollen and thickened forms.

All the 37 strains showed only one cilium. This agrees with Gottschlick's results and it appears probable that earlier statements to the contrary may have been due to imperfect recognition of the organism.

Gelatine plate cultures at 20° C. showed small white granular colonies, as if powdered with glass, which soon became surrounded by a zone of liquefaction. Alkaline potato cultures showed after 18 hours at 37° C. white glassy layers which later took on a yellow brown colour.

In milk five of the 37 strains gave no coagulation, while the rest caused coagulation in three to eleven days. On solidified blood serum during fifteen days' observation all but seven strains liquefied the medium. The time of onset of liquefaction was, however, variable.

On blood media the author was unable to confirm Kraus's results as to absence of haemolytic power in the case of strains of true cholera, no less than 30 strains showing definite haemolysis within 48 hours on sheep blood agar plates. While the author is acquainted with the variations of the agglutinating power of true cholera, she holds agglutination to be the most reliable test in the recognition of strains.

W. J. P.

Craster (C. F.). **The Recognition of the Cholera Vibrio.**—*Jl. Experim. Med.* 1914. June. Vol. 19. No. 6. pp. 581-592.

After discussing the literature of the cholera-like vibrios the author gives some interesting experimental results. A series of these organisms after five passages through guinea-pigs was found to have acquired in marked degree positive specific agglutination reactions. In the case of two of the strains the agglutination at the commencement was not positive in a higher dilution of serum than 1–100, while after passage it was positive in a serum dilution of 1–2,000. The virulence to animals did not increase markedly in these cases and in no case was a positive Pfeiffer's reaction obtained with these modified organisms. Some of the modified strains, however, were susceptible to bacteriolysis by a specific serum *in vitro*. No control experiments are given to show that the original strains were not similarly susceptible.

The author dwells on the importance of the fact that absence of agglutination in the case of a vibrio does not negative the possibility of its being a cholera vibrio.

W. J. P.

Courmont (J.), Lesieur (Ch.), Dufour & Marchand. **Etude Anatomo-Clinique et Bactériologique de Nouveaux Cas Lyonnais d'Entérite Estivale Cholériforme et Dysentériforme à Microbes Spiralés.**—*Bulls. et Mémes. Soc. Méd. Hôpit. de Paris.* 1913. Dec. 25. 3 sér. Vol. 29. No. 38. pp. 848-855. With 1 text fig.

Two cases are described resembling cholera, from which the specific vibrio could not be recovered. Both these cases showed large numbers

of spiral forms in the gut and the authors are inclined to believe the spirals are of great significance. The first case started with colic and nausea; this was followed by profuse diarrhoea, algidity, prostration, pain in the epigastrium, vomiting, cramps and hypothermia, the patient dying on the fifth day of the disease. Post-mortem congestion of the intestine, most marked in the case of the large intestine, was found and the contents of the gut at this level were of a rice grain like character.

Bacteriology. The direct smears of intestinal contents showed no vibrios but a great number of fine spiral forms 10–12 μ long. Attempts at cultivation of the spiral forms did not succeed. The ordinary methods for the recovery of the vibrio cholera were tried without success. Proteus and coliform organisms were cultivated. The spirals in direct smears stain by dilute carbol-fuchsin and do not retain Gram's stain. The second case was very similar. A resumé of the literature on spirillary forms found in the gut is given and the many different opinions of the authors as to their significance discussed. Nothing definite seems to be known concerning their pathogenicity in man at present.

W. J. P.

SLEEPING SICKNESS.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **Morphology of Various Strains of the Trypanosome causing Disease in Man in Nyasaland: The Human Strain (continued). VI to X.** —*Proc. Roy. Soc.* 1914. Sept. 15. Vol. B 88. No. B 602. pp. 190-205. With 9 Charts.

Reference is made to a previous paper in which five strains of the trypanosome infecting man in Nyasaland are described [see this *Bulletin*, Vol. 1, p. 659]. In this paper results of examination of another five strains are given. Strains VII, VIII and X were inoculated directly into the rat from which the drawings and measurements were made. In Strains VI and IX a single monkey intervened. Strains were thus obtained under fairly similar circumstances. A table is given showing the passages of all ten strains through animals between man and the rat, whose trypanosomes were drawn and measured in the case of each. The authors write:—"On comparing the curves from the ten strains it cannot be said that the passage from dog to rat, or from monkey to rat, or direct from man to rat, has had any marked influence on the character of the curve. But in these cases only a single monkey or dog intervened."

Biometric curves constructed from the measurements of 500 individuals of each of the five strains taken on nine consecutive days from the rat are given.

A number of experiments were made to ascertain whether inoculating animals with a single trypanosome gave rise to an infection of the original dimorphic type. Single trypanosomes were picked out by means of dilution and capillary tubes. In this manner six experiments, three of which were successful, were performed. In each case the long and slender form of trypanosome was isolated and injected. Biometric curves were constructed from the resulting infection in rats. Short and stumpy, intermediate, and long and slender forms were found. Among the short and stumpy there was a large percentage of the blunt-ended posterior-nuclear forms. The authors consider that from these experiments it can be concluded that in the dimorphic trypanosome causing disease in man in Nyasaland we have to deal with the single species. In the following table measurements of the length of the trypanosomes of the five strains are given.

A similar table is given comparing measurements of the breadth of the trypanosomes of the five strains.

The authors have constructed a curve showing the distribution by percentages in respect of length of 2,500 individuals of the "Human" strains VI to X. This curve is very similar to that made from strains I to V except that it lies a little to the shorter side.

In each of the five strains posterior nuclear forms were found among the short and stumpy varieties. In Strain VI, 14·3 per cent. of the stumpy forms exhibited the posterior nucleus; in Strain VII, 13·4 per cent.; in Strain VIII, 24·2; in Strain IX, 28·6 per cent., and in Strain X, 5 per cent.

Table XXII.—Measurements of the Length of the Trypanosomes of the Five Human Strains VI to X. The trypanosomes have been taken from the rat alone.

Date.	Strain.	Name.	Number of Trypanosomes measured.	In microns.		
				Average length.	Maximum length.	Minimum length.
1913	VI	Manakumpara	500	21·7	32·0	15·0
1913	VII	Yoramu	500	22·5	34·0	16·0
1913	VIII	Mekka	500	22·4	33·0	16·0
1913	IX	Mkanthama	500	21·2	33·0	14·0
	X	Dongolosi	500	23·5	32·0	17·0
				22·3	34·0	14·0

The following is the conclusion :—

" These further five strains of this trypanosome, isolated from five natives in Nyasaland, belong to the same species, *Trypanosoma brucei vel rhodesiense*, the trypanosome causing disease in man in Nyasaland."

W. Yorke.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **The Trypanosome causing Disease in Man in Nyasaland. II. The Wild-game Strain. III. The Wild *Glossina morsitans* Strain. Part II. Susceptibility of Animals.** *Proc. Roy. Soc.* 1914. Sept. 15. Vol. B 88. No. B 602. pp. 205-212.

In this paper the action on animals of the " Wild Game " Strain and the " Wild *Glossina morsitans* " strain is given and they are compared in this respect with each other and with the " Human " Strain. The results are given in detail in the form of tables and are summarised as follows :—

Table XI.—The Average Duration, in Days, of the Wild-game, Wild *Glossina morsitans* and Human Strains of the Trypanosome causing Disease in Man in Nyasaland, in regard to their Virulence towards Various Animals.

Strain.	Ox	Goat.	Monkey.	Dog	Rabbit.	Guinea-pig.	White rat.
Human	134	42	26	34	28	67	30
Wild Game	—	46	38	41	—	—	32
Wild *G. morsitans* ..	Rec.	54	38	29	47	81	26

Table XII.—The Percentages of Recoveries in Various Animals of the Wild-game, Wild *Glossina morsitans* and Human Strains of the Trypanosome causing Disease in Man in Nyasaland.

Strain.	Ox.	Goat.	Monkey.	Dog.	Rabbit.	Guinea-pig.	White rat.
Human	80	0	0	0	0	0	0
Wild-game	–	0	0	0	–	–	0
Wild *G. morsitans* ..	100	6	7	4	0	0	0

The following are the conclusions :—

" 1. The pathogenic action on various animals of the Human strain, the Wild-game strain and the Wild *G. morsitans* strain is so much alike, that it may be concluded that they all three belong to the same species of trypanosome.

" 2. This species is *T. brucei vel rhodesiense*, the trypanosome causing disease in man in Nyasaland."

W. Y.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **The Trypanosome causing Disease in Man in Nyasaland: The Liwonde Strain. Part I. Morphology. Part II.—Susceptibility of Animals.**—*Proc. Roy. Soc.* 1914. Aug. 27. Vol. B 88. No. B 601. pp. 97-111. With 5 charts.

This strain was obtained in the " Fly area " of the Upper Shiré Valley. At the time it was procured, no cases of Sleeping Sickness had been reported from this district. Lately, however, cases have been discovered in Mpimbi in the south of the district. Three dogs infected with the wild *Glossina morsitans* strain of the trypanosome, were taken to Kasu, and other animals—monkeys, dogs and rats—inoculated from them. For purposes of description, measurement and comparison, only trypanosomes from rats were used.

Posterior nuclear forms were found in considerable numbers as is shown in the following table :—

Table XV.—Percentages of Posterior-nuclear Forms found among the Short and Stumpy Varieties of the Trypanosome of the Human, Wild-game, Wild *Glossina morsitans*, and Liwonde Strains.

Date.	Strain.	Animal.	Percentage among short and stumpy forms.
1912 ..	Human	Rat.	17·8
1912 ..	Wild-game	,,	26·2
1912 ..	Wild *G. morsitans*	,,	12·5
1913 ..	Liwonde	,,	19·8
		Average	19·1

The pathogenicity of each of the three strains in goats, monkeys, dogs, guinea-pigs and rats is given in three tables. The authors write :—

" The infection set up in the various animals by the Liwonde strain gave rise to symptoms and appearances during life, and pathological changes in the various organs after death, alike and similar in every way to those caused by the Human strain, Wild-game strain, and the Wild *G. morsitans* strain of *T. brucei vel rhodesiense* found in the ' Proclaimed Area.' "

The conclusions are :—

" 1. The three wild *G. morsitans* strains from the Liwonde district resemble each other closely, and all belong to the same species of trypanosome.

" 2. The Liwonde strain belongs to the same species as that occurring in man, wild game, and wild *G. morsitans* inhabiting the ' Proclaimed Area,' Nyasaland—*T. brucei vel rhodesiense*.

" 3. Hence it would appear that wild *G. morsitans* occurring in a district 100 miles south of the ' Proclaimed Area ' are infected with the trypanosome which causes the human trypanosome disease of Nyasaland."

W. Y.

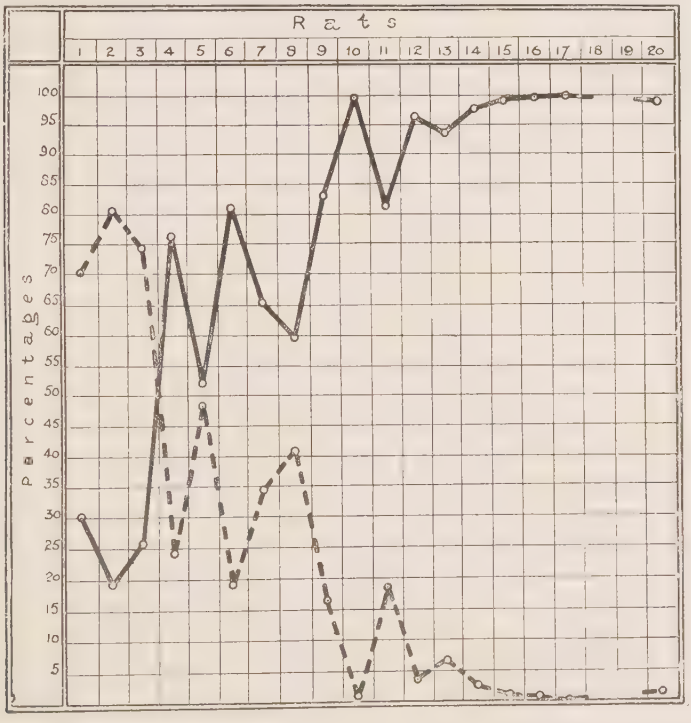
Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **The Trypanosome causing Disease in Man in Nyasaland. The Naturally Infected Dog Strain. Part I.—Morphology.**—*Proc. Roy. Soc.* 1914. Aug. 27. Vol. B 88. No. B 601. pp. 111-130. With 3 plates and 8 charts.

This strain, known as "The Naturally Infected Dog Strain," has been found three times in dogs in the Proclaimed Area. It differs so much from the others that it is doubtful if it should be included among the various strains already described, viz.:—"Human," "Wild Game," "Wild *G. morsitans*," and "Mzimba."

This "Naturally Infected Dog Strain" is almost harmless to monkeys and guinea-pigs. Moreover, there is a comparative absence of the blunt-ended posterior-nucleated forms. As a result of these differences, the strain is described fully and completely.

Large numbers of trypanosomes were measured and the results are set forth in tables and biometric curves. The proportion of posterior-nuclear forms found among the short and stumpy varieties of the trypanosome in one of the earlier infected rats was 7 per cent., whereas, after passage of the strain through rats for 7 months, it was only 1·3. After passage through rats for two years the short and

* Curves representing the Gradual Change of this Trypanosome from a Dimorphic Type to a Monomorphic.



* Reproduced by permission from the *Proceedings of the Royal Society*.

stumpy forms had nearly all disappeared and with them the posterior nuclear forms. Dealing with the comparison of the morphology of the "Naturally infected dog strain" with the other strains of trypanosome causing disease in man in Nyasaland, the authors state that it is impossible to separate the "Naturally infected dog strain" from the others by microscopic examination, but there were very few posterior-nuclear forms and as a rule, the thick blunt-ended type was not so common as in the others. How this aberrant strain arose in these three chronically infected dogs, it is impossible to say. It was not found anywhere else. Possibly, the long sojourn in the blood of the dog had modified and weakened the strain and attempts were made to prove this but without success, as all dogs inoculated with the ordinary strain died in a few weeks and inoculations from those which lingered longest showed no signs of weakening or change of any kind.

The conclusions are :—

"1. The Naturally Infected Dog Strain differs slightly from the other strains of the trypanosome causing disease in man in Nyasaland, in that there are fewer of the posterior-nucleated, blunt-ended forms which are sometimes so much in evidence in the ordinary strains.

"2. Taking into consideration the fact that this strain was only found in three chronically infected dogs, it is concluded that it is an aberrant strain of the widely spread species *T. brucei vel rhodesiense*, the trypanosome causing disease in man in Nyasaland."

Part II.—**Susceptibility of Animals.**—*Ibidem.* pp. 130-138.

In tables, results of inoculation of various animals are given.

Only one of four oxen became infected and parasites were seen on but three occasions in this ox and then in scanty numbers. The animal was still alive and in perfect health after 335 days. The trypanosome had little effect on goats. Not a single animal of the 21 inoculated died of the disease and 12 proved refractory. Of two sheep, one died after 64 days and the other recovered. Twenty-seven monkeys were inoculated; six became infected and recovered and the remainder were refractory. After several passages the strain became virulent to dogs; of the 28 used for experiments, 19 died on an average in 36·8 days (11 to 102), four never showed trypanosomes in their blood and five recovered. The post mortem appearances were identical with those found in nagana—enlargement of the spleen, gelatinous oedema about the vessels at the base of the heart, petechiae of mucous membranes, and corneal opacity. Two rabbits were inoculated and both died—one after 109 and the other after 256 days; both exhibited corneal opacity and presented the same symptoms as those described in nagana rabbits but in a much milder degree. Guinea-pigs proved almost refractory to this strain; only 2 of 21 animals inoculated showed trypanosomes. Parasites were seen on one occasion only and the animals appeared to have recovered, as sub-inoculated rats remained unaffected. Of 48 white rats which were inoculated, all died. The duration of the disease was on an average 30·8 days (7 to 94). There was an enlargement of the spleen and the blood swarmed with trypanosomes. The authors write :—

"This shows the great difference in regard to action on animals which exists between the Naturally Infected Dog strain and the Human strain, and if similar tables referring to other strains—for example, the Zululand

1913 Strain—be compared, the same difference is found. It might be said that this alone is sufficient to make it rank as another species, and, as already mentioned, if this strain had been found among the wild game and wild *Glossina morsitans* in Nyasaland, this would have been justified. It was, however, only found in three chronically infected dogs, and so it is thought best with our present knowledge to include it among the strains of *Trypanosoma brucei vel rhodesiense.*

" If in the future it should be decided to give it specific rank the name *T. anceps* is suggested. This name seems appropriate on account of the uncertainly which exists as to the classification of this trypanosome."

The conclusions are :—

" 1. The Naturally Infected Dog strain is fatal to dogs, rabbits, and white rats, but oxen, goats, monkeys, and guinea-pigs appear to be refractory.

" 2. The Commission is of opinion that this is an aberrant or exceptional variety or strain of the trypanosome causing disease in man in Nyasaland—*T. brucei vel rhodesiense.*"

Part III.—**Development in** *Glossina morsitans.—Ibidem.* Sept. 15. No. B 602. pp. 213-218.

A short account of the development of the trypanosome in *Glossina morsitans* is given ; it was found that this was precisely similar to that of the " Human Strain " of the trypanosome.

Eleven experiments were conducted with laboratory-bred flies—two were positive and nine negative. Of the 376 flies used, 14 were found to be infected. This small percentage (3·7 per cent.) is partly due to the fact that in some of the experiments few or none of the flies were dissected. Details of the experiments are given in the following table :—

Table I.—Laboratory-bred Flies.

Date.	Expt.	No. of flies used.	Experiment positive or negative.	No. of flies dissected.	No. of infected flies found.	No. of days before flies became infective.	Temperature at which flies kept.
1912.							
Sept. 7	1257	25	—	25	0	..	84° F. (29° C.)
Oct. 23	1499	26	—	26	1	..	,,
Dec. 3	1668	10	—	10	0	..	,,
1913.							
Jan. 13	1753	50	—	18	0	..	84° F. (29° C.)
Mar. 24	2018	55	—	18	2	..	,,
April 7	2067	30	+	30	3	24	,,
May 9	2018A	40	—	36	7	..	,,
June 13	2226	40	—	8	1	..	,,
July 21	2303	40	—	29	0	..	,,
Aug. 30	2394	40	+	0	0	58	,,
Nov. 12	2433	20	—	15	0	..	,,

In the two positive experiments, 24 and 58 days respectively elapsed before the cycle of development of the trypanosome was complete in *Glossina morsitans.* In Experiment 2067 three infected flies were found, but in only one were the salivary glands invaded. In Experiment 2394 a positive result was also obtained but the flies were not dissected. The types of trypanosomes found in the infected flies were

identical with those observed in the development of the trypanosome causing disease in man in Nyasaland and also in that of "*T. brucei*, Zululand, 1913."

The conclusion is :—

"The trypanosome of the Naturally Infected Dog strain belongs to the same group as *T. gambiense* and *T. brucei vel rhodesiense*, the trypanosome causing disease in man in Nyasaland, and is probably merely a weak strain of the latter species."

Part IV.—**Experiments on Immunity.**—*Ibidem.* pp. 219-226.

The experiments described in this paper were undertaken to ascertain whether animals which had recovered from the "Naturally Infected Dog Strain" were immune to the different strains which have been described in previous papers as the "Human," "Wild Game," "Wild *Glossina morsitans*," "Zululand 1913," etc. There were practically no recoveries from the "Human" and other strains and hence there were no complete cross-inoculation experiments. One goat apparently recovered from the Mzimba strain and a goat, monkey and dog from the "Wild *Glossina morsitans*" strain and these were included, but apart from them the only animals which recovered were those infected with the weaker "Naturally Infected Dog Strain." Details of the experiments are set out in 18 tables. As a result of this work it was found that the "Naturally Infected Dog Strain" failed to immunise animals against the "Human," "Wild *Glossina morsitans*," and "Zululand 1913" strains, but it was not determined whether the latter strains would have immunised animals against the "Naturally Infected Dog Strain."

The following are the conclusions :—

"1. The Naturally Infected Dog strain does not protect animals from the Human, Wild *G. morsitans*, and Zululand, 1913, strains.

"2. The Wild *G. morsitans* strain and the Naturally Infected Dog strain do not protect animals from the Human or the Zululand, 1913, strain.

"3. The Wild *G. morsitans* strain does not protect against the Human strain.

"4. In spite of the damaging evidence of these experiments, the Commission still holds the opinion that the Naturally Infected Dog strain is a weak strain of the trypanosome causing disease in man in Nyasaland, *T. brucei vel rhodesiense*."

W. Y.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **Trypanosomes found in Wild *Glossina morsitans* and Wild Game in the "Fly-Belt" of the Upper Shiré Valley.**—*Proc. Roy. Soc.* 1914. Aug. 6. Vol. B 88. No. B 600. pp. 38-41.

The fly area to which this paper refers extends along the Shiré River from Lake Pamalombe to the Murchison cataracts. Although it is thickly populated, human trypanosome disease, though probably existing, has not yet been discovered in the district.* Cattle cannot be kept, and goats and dogs are constantly destroyed by trypanosomiasis, so that they have to be continually imported from the highlands. Game is very abundant, particularly in the dry season when herds of eland, koodoo, waterbuck and impala concentrate in

*As stated on page 340 human trypanosomiasis has been found in the south of this district.

the vicinity of the river. In the wet season, elephant and buffalo are met with. The fly area is crossed by two of the most frequented roads in Nyasaland—that running from Zomba to the north and the main road from Liwonde to Fort Johnston.

The method employed in the feeding experiments was the same as that described in a previous paper [see this *Bulletin*, Vol. 2, p. 234], except that monkeys were unobtainable and the flies were fed only twice on each animal.

It was found that the " fly " in the Upper Shiré district carried the same four species of trypanosomes as those found in the Proclaimed Sleeping Sickness area, viz.—*T. brucei vel rhodesiense*, *T. pecorum*, *T. simiae* and *T. caprae*. In a series of seven experiments all the animals on which flies were fed became infected. In six the dogs were infected with *T. brucei vel rhodesiense*; in the second and fifth there was a double infection with *T. pecorum*, and in the seventh infection with *T. pecorum* alone. None of the goats was infected with *T. brucei*, but six with *T. pecorum*, one with *T. simiae* and five with *T. caprae*.

The blood of a number of game—zebra (1), impala (7), koodoo (2), waterbuck (6)—were examined. *T. pecorum* was found four times—twice in impala and twice in waterbuck. *T. brucei vel rhodesiense* was found once in a waterbuck and *T. caprae* three times—once in an impala and twice in waterbuck. The conclusions are :—

" 1. The trypanosomes found in the wild *G. morsitans* and wild game of the Upper Shiré 'fly area' are identical with those found 100 miles farther north in the Proclaimed area.

" 2. The trypanosome causing disease in man in Nyasaland—*T. brucei vel rhodesiense*—is frequently met with, so that it is probable cases of this form of sleeping sickness will be found among the natives of this district."

W. Y.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **Infectivity of *Glossina morsitans* in Nyasaland during 1912 and 1913.**—*Proc. Roy. Soc.* 1914. Aug. 6. Vol. B 88. No. B 600. pp. 43-48.

The object of this paper is to set up a rough standard of the proportion of infected to non-infected tsetse flies in an ordinary fly area where wild game abounds. The flies were collected in the Proclaimed area of Nyasaland.

In 1912 a total of 1,975 flies were dissected between the months of January and November; 129 were found to be infected with trypanosomes, or 6·53 per cent. (males 86 per cent., females 14 per cent.); in 1913, 1,060 flies were dissected, of which 91 were infected—8·58 per cent. Details of the results of dissection of the infected flies are given in tables, as are also results of 60 attempts to determine the infectivity of the fly by injection of the contents of the infected organs into healthy animals. In only three cases did animals become infected, once with *T. simiae* and twice with *T. brucei vel rhodesiense*. In only two cases were the salivary glands found to be infected. This infection was proved to be *T. brucei vel rhodesiense* by injecting the glands into rats. In the 1912 experiments no attempt was made to diagnose directly the species of trypanosomes with which the flies were infected, but in 1913 this was done. Invasion of the salivary glands could only

be *T. brucei vel rhodesiense*; invasion of the intestines, labial cavity and hypopharynx—*T. pecorum* or *T. simiae*, and size would distinguish between the two. Lastly, if only the labial cavity and hypopharynx were seen to contain flagellates, *T. caprae* was indicated—here also the size and character of the trypanosomes in the hypopharynx assisted the diagnosis. No injections of the contents of the organs into healthy animals were made in the 1913 experiments. As a result of the direct diagnosis of 1,060 flies, *T. brucei vel rhodesiense* was found once; *T. pecorum* six times; *T. simiae* 12 times, and *T. caprae* 14 times. The authors write: "It must, however, be confessed that the margin of error in this calculation may be large."

The following is the conclusion :—

"In 1912, 6·53 per cent. of the *G. morsitans* found in the 'Proclaimed' or Sleeping Sickness Area, Nyasaland, were infected with pathogenic trypanosomes; in 1913, 8·58 per cent."

W. Y.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **_Glossina brevipalpis_ as a Carrier of Trypanosome Disease in Nyasaland.**—*Proc. Roy. Soc.* 1914, Aug. 6. Vol. B 88. No. B 600. pp. 20-32. With 1 plate.

Glossina brevipalpis was found in many spots along the west shores of Lake Nyasa. In this paper the authors give (1) a short account of the habits of this tsetse fly; (2) the results of the dissection of the flies; (3) the infectivity of the wild flies; and (4) the results of various transmission experiments.

G. brevipalpis was found in a tract of country forming the delta of the Lingadzi. This tract is broken up by swampy hollows and streams and is covered with palm forest and a dense undergrowth of high grass and bush. The fly is crepuscular in its habits. It only makes its appearance as evening approaches and is not found to follow or settle upon passers-by like other tsetse flies. In the dim light they are difficult to see and resemble little bits of earth on the path, but attention is attracted by the sound of buzzing of the flies if disturbed. The hard trodden surface of the path seems to have an irresistible attraction for them. They do not move about in search of food, but remain motionless for several minutes, and when they move it is only to fly up and immediately settle again in the middle of the path. They were never seen on the roads at dawn. Of the 500 flies caught and examined all were males. It seems to be a habit of the males to frequent the paths in the evening, whilst the females, presumably, hide in the thick jungle. Only four females were found among several hundred *G. brevipalpis* dissected at the laboratory. When kept in captivity the flies remained dormant on the side of their cage during the day; at night they are very active.

If the side of the cage be applied to the skin of a goat or a dog, they will feed with avidity at any time of the day or night. Of 50 wild flies seven contained recognisable blood; this, in six cases, was antelope blood, and in the 7th probably human.

The result of the dissection of 496 wild flies is given in a table—44 were positive and 452 negative. Among the 44 flies which contained flagellates, *T. brucei vel rhodesiense* was found once, *T. pecorum* nine

times, *T. simiae* once, and *T. grayi* eight times. In 10 flies, flagellates were considered to belong to a pathogenic type of unknown species. No opinion can be expressed about the remaining 15. The authors remark on the occurrence of *T. grayi*. They point out that this is common to both *G. brevipalpis* and *G. palpalis*, both of which live near water. It indicates that the vertebrate host of *T. grayi* is probably some water animal such as the crocodile or iguana, or some water bird.

The results of experiments made to test the natural infectivity of *G. brevipalpis* by feeding them on healthy animals are given in the following table:—

TABLE II.—Feeding Wild *Glossina brevipalpis*.

Date.	No. of flies fed.	Monkey.				Dog.				Goat.			
		T. brucei vel rhodesiense.	*T. pecorum.*	*T. simiae.*	*T. caprae.*	*T. brucei vel rhodesiense.*	*T. pecorum.*	*T. simiae.*	*T. caprae.*	*T. brucei vel rhodesiense.*	*T. pecorum.*	*T. simiae.*	*T. caprae.*
1912.													
June 14	42	–	–	–	–	–	–	–	–	–	–	–	–
1913.													
Mar. 18	146	–	–	–	–					–	–	–	–
April 29	541	–	+	–	–	–	+	–	–	–	+	–	–
May 7	90	–	–	–	–								
June 25	276	–	–	–	–	–	–	–	–	–	–	–	–
Total ..	1,095												

A series of experiments was undertaken to ascertain if *G. brevipalpis* can act as a carrier of the various pathogenic trypanosomes found in Nyasaland; wild flies were used. In six experiments to transmit *T. brucei vel rhodesiense* 232 wild *G. brevipalpis* were used without any positive results. Only 53 flies were dissected and 8 infected flies found. The results of dissection of the infected flies are given in Table V.

Expt.	Time, Days.	Proboscis.	Alimentary tract.	Salivary glands.
2201	30	–	+	–
2201	37	–	+	–
2213	33	–	+	+ + +
2213	46	+	+ +	–
2232	37		+	–
2232	37		+	–
2232	44	–	+	–
2232	44	–	+	–

In Experiment 2201, two infected flies were found. One appeared to be infected with *T. grayi* and the other with a trypanosome of a pathogenic type. One fly was found in Experiment 2213 to have a very heavy infection of the salivary glands and intestines. This fly had failed to infect a dog which it had been fed upon, and injection of the salivary glands and contents of the gut into a white rat was negative. Thus, it would appear that the fly had not yet reached an infective stage. In a plate, the development of the trypanosome causing disease in man in Nyasaland in the salivary gland of this species of tsetse is represented. The long, slender, developmental form of trypanosome found in the gut invades the salivary glands. In this situation the posterior extremity lengthens somewhat and the micro-nucleus and the flagellum pass forward. This appears to be the commencement of the change to the crithidial type, where the micro-nucleus and flagellum lie anterior to the nucleus. In this stage the anterior portion of the parasite has broadened out and the posterior becomes attenuated. In still later stages the attenuated posterior extremity has disappeared and the parasite has become contracted and thickened until it assumes a rounded form and the flagellum is folded on itself. In this encysted form the trypanosomes are found massed together in the lumen of the salivary glands. These forms later unfold, the micro-nucleus is now posterior to the nucleus and the crithidial stage has become trypanosomal. Finally, the typical salivary gland form of the trypanosome is developed. This constitutes a reversion to the blood form, from which the cycle of development began, and is the only infective form. The authors conclude that *G. brevipalpis* is capable of acting as a carrier of *T. brucei vel rhodesiense*.

In three experiments to transmit *T. brucei* of Zululand, 200 wild *G. brevipalpis* were used. One experiment was positive and the other two negative. *G. brevipalpis* is hence capable of acting as a carrier of *T. brucei*, Zululand 1913.

One hundred and thirty wild *G. brevipalpis* were used in two experiments to transmit *T. pecorum*. One was positive and the other negative, from which the authors conclude that *G. brevipalpis* can act as a carrier of *T. pecorum*.

Three experiments were undertaken with wild *G. brevipalpis* to transmit *T. caprae*. One was negative and two positive. On examining the positive experiments they were found to be *T. pecorum* infections and not *T. caprae*. The animals were probably infected by naturally infective *G. brevipalpis*. No infection by *T. caprae* took place, but one of the flies on dissection was shown to have an undoubted development of *T. caprae* in the labial cavity and hypopharynx. From this the authors conclude that *G. brevipalpis* is capable of acting as a carrier of *T. caprae*.

W. Y.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **Trypanosome Diseases of Domestic Animals in Nyasaland. III.**—*Trypanosoma pecorum.* **Development in** *Glossina morsitans.*—*Proc. Roy. Soc.* 1914. Aug. 6. Vol. B 88. No. B 600. pp. 33-37. With 1 plate.

In this paper an account is given of the development of *T. pecorum*

in *Glossina morsitans*. Seven experiments with laboratory bred flies were carried out with five positive and two negative results. Of the 240 flies used 24 became infected. The first two experiments were carried out at ordinary temperature, whilst in the others the flies were kept in the incubator. Details of the five positive experiments are given in a table. The incubation period of *T. pecorum* in *Glossina morsitans* was found to vary between 19 and 53 days. In the following table the results of dissection of the infected flies found in the positive experiments are given :—

TABLE IV.—LABORATORY-BRED FLIES. POSITIVE EXPERIMENTS.

Expt.	Time days.	Proboscis.		Proventriculus.	Crop.	Foregut.	Midgut.	Hindgut.	Salivary glands.
546	30	−		−	−	+	+	+	−
546	64	−		−	−	+ +	+ +	+ +	−
546	84	−		−	−	+ +	+ +	+ +	−
546	84	+	+	+ +	+ +	+ +	+ +	+ +	−
524	27	−		−	−	−	+ +	+ +	−
524	55	+		+	−	+ +	+ +	+ +	−
		Labial cavity.	Hypopharx.						
1737	27	+ +	+ +	+ +	+ +	+ +	+ +	+ +	−
1737	28	+	−	+	−	+ +	+ +	+	−
1737	30	+ +	+ +	+ +	−	+ +	+ +	+ +	−
1853	17	+ +	+ +	+ +	−	+ +	+ +	+ +	−
1853	22	−	−	−	−	+	+	+	−
1853	23	+	−	+	−	+ +	+ +	+ +	−
1853	25	+ +	+ +	+	−	+ +	+ +	+ +	−
1853	26	+ +	+ +	+	−	+ +	+ +	+ +	−
1950	17	−	−	+	−	+ +	+ +	+ +	−
1950	19	+ +	+ +	−	−	+ +	+ +	+ +	−
1950	24	−	−	−	−	−	+	−	−
1950	26	+ +	+ +	+	−	+ +	+ +	+ +	−
1950	31	+ +	+ +	+	−	+ +	+ +	+ +	−
1950	31	+ +	+ +	+ +	−	+ +	+ +	+ +	−

In Experiment 546 only one infective fly was found; in Experiment 524 two infected flies were found. In one of these the development was incomplete, in the other complete. In Experiment 1737 two flies were infective, in 1853, three, and in 1950, four. In no instance was invasion of the salivary glands observed. In another table results of dissection of the four infected flies in the negative experiments are recorded. In none of these had the development of the trypanosomes reached the hypopharynx and consequently none of them were infective. In a coloured plate are depicted the various types of trypanosomes found in the infected flies. The conclusions are :—

"1. That *T. pecorum* is capable of passing through a cycle of development in *G. morsitans*, the flies becoming infective some 20 days after feeding on an infected animal.

"2. That *T. pecorum* belongs to the same group as *T. simiae*, the development taking place at first in the gut and afterwards passing forward into the labial cavity and finally into the hypopharynx.

"3. That the final stage of the development only occurs in the hypopharynx, where the trypanosomes revert to the 'blood form' and become capable of setting up infection if injected under the skin of healthy animals."

W. Y.

Bruce (David), Hamerton (A. E.), Watson (D. P.) & Lady Bruce. **Trypanosome Diseases of Domestic Animals in Nyasaland. *Trypanosoma caprae* (Kleine). Part III.—Development in *Glossina morsitans*.—*Proc. Roy. Soc.* 1914. Aug. 27. Vol. B. 88. No. B 601. pp. 92–96. With 1 plate.**

Six experiments were undertaken with the object of transmitting *T. caprae* by *Glossina morsitans*; five of the experiments were positive and one was negative. In all, 170 laboratory-bred flies were used, and 46 infected flies were found (27·1 per cent.). The first three experiments were carried out at laboratory temperature, and in the last three the flies were kept in the incubator. Details of the experiments are given in Table I.

Table I.—Laboratory-Bred Flies.

Date.	Expt.	No. of flies used.	Experiment positive or negative.	No. of infected flies found.	No. of days before flies became infective.	Mean temperature.
1912						
April 16	444	12	+	1	16	71°F. (22·1°C.)
June 3	617	33	—	0	—	65°F. (18·3°C.)
June 3	1215	22	+	1	21	65°F. (18·3°C.)
1913						
Jan. 18	1777	35	+	11	19	84°F. (28·8°C.)
Jan. 22	1784	35	+	20	19	84°F. (28·8°C.)
April 1	2046	33	+	13	20	84°F. (28·8°C.)

The authors write: "It is difficult to understand the difference in the number of infected flies found. In Experiments 444 and 1215 only 8 and 5 per cent. respectively of the flies became infected, whereas, in the last three experiments, an average of more than 40 per cent. was found. The flies in the second group were kept, it is true, at a temperature similar to that which they would find in summer in the low country, while the first three experiments were done in winter and at the ordinary temperature of the laboratory. This no doubt would explain the difference to some extent. Again, goats and sheep infected with *T. caprae* are unsatisfactory animals to feed flies on. One day the trypanosomes are present in small numbers in the blood, the next day it may be impossible to find any; very seldom are they in any numbers. It is quite possible, then, that flies may feed on an infected goat or sheep without taking in a single trypanosome."

From the five positive experiments it would appear that the average incubation period of 19 days elapses before the cycle of development of *T. caprae* is complete in *Glossina morsitans*.

The results of the dissection of the infected flies are given in a table. It was not, however, until the last experiments that the labial cavity and hypopharynx were examined separately. In the first four experiments the presence or absence of trypanosomes in the proboscis as a whole was noticed. In the first two experiments only a single infected fly was found in each. In the third 11 infected flies were found and in the fourth 20. The number of trypanosomes in the labial cavity varies greatly. Sometimes the lumen of the tube is densely crowded, whilst in others only a single colony of parasites is found. The same applies in the case of the hypopharynx. Excep-

tionally the flagellates may be seen in the oesophagus. This was noted twice among the 46 flies found to be infected. A number of the developmental forms seen in the labial cavity and hypopharynx are depicted in a coloured plate.

The following are the conclusions :—

"1. *Trypanosoma caprae* is capable of passing through a cycle of development in *G. morsitans*, the flies becoming infective some 19 days after feeding on an infected animal.

"2. *Trypanosoma caprae* belongs to the same group as *T. vivax* and *T. uniforme*, the development taking place only in the proboscis.

"3. The final stage of the development takes place in the hypopharynx where the trypanosomes revert to the original 'blood form' and become infective."

W. Y.

Nyasaland Protectorate. **Sleeping Sickness Diary. Part xxiii.** By the Acting Principal Medical Officer.—10 pp. Zomba : Printed by the Government Printer.

Between January 1st and May 30th of this year 20 cases of sleeping sickness have been found in the Protectorate, 15 in the Dowa district, 4 in the Marimba, and one in Zomba. This brings the total number of cases discovered in Nyasaland up to 192. Details are given of the 20 cases. Conran draws attention to an interesting case, that of Mekta, aged six. He writes :—

"This boy's case was diagnosed on the 19th May, 1913, and he is still alive and apparently well. He takes his food well and appears well nourished. He complains of no pains and plays with the other village boys all day. There is no oedema or other physical signs. His temperature is normal. His pulse is somewhat rapid on examination, but this is probably due to excitement. No trypanosomes have been found on the last three occasions when examined. That the original diagnosis was correct is certain because not only have I seen trypanosomes in both smear and fresh blood preparations but a citrated specimen of the blood was used by the Royal Society's Commission for inoculation purposes and a strain of trypanosomes thus obtained."*

With regard to prophylactic measures, the author writes that clearing of the bush around villages is being carried on and a small sum of money has been sanctioned for this purpose. Cases of sleeping sickness have now been discovered over practically the whole "Fly area" of the Protectorate.

W. Y.

Northern Rhodesia. [**Report on Sleeping Sickness in Northern Rhodesia.**] [Kinghorn (A.), Medical Officer.]—MS. Report received in Colonial Office.

The author examined natives in the Serenje Sleeping Sickness Area, and in a portion of the Petauke District. In the Serenje area, 20 villages were visited and some 1981 natives examined. Two cases of trypanosomiasis were diagnosed; both occurred in Sunda's village,

*This case is perhaps Strain VIII, Mekka, of the Scientific Commission of the Royal Society (see above, p. 339).

which is situated on the Kapamba river, near its junction with the Luangwa. The condition of these two patients at the time of diagnosis was as follows :—

"1. *Mungwali*, aet. 45. Has been sick for 1½ months. Now well-advanced, showing marked oedema of legs, and inability to walk. No glandular enlargement. Trypanosomes present in blood.

"2. *Nondo*, aet. 35. Said to have been ill only one week with headache. Is unable to walk well, shows marked tremors and confused speech. No glands. Trypanosomes present in blood."

Kinghorn visited 23 villages in the Petauke district and examined 1,483 natives without finding a single case of sleeping sickness. Probably at least 75 per cent. of the total population were palpated.

In conclusion the author writes :—

"The data obtained in this examination would show, therefore, that the incidence of the disease in the Serenje Area is 0·1 per cent., while in the Petauke District it is nil.

"Together, the incidence would be 0·057 per cent. or slightly less than the figure obtained in the examination of the Mpika, Chinsali and Lundazi District last year, viz, 0·08 per cent. The results, I think, need no comment, as only one conclusion is possible, that the disease is showing no tendency whatever to become epidemic."

W. Y.

Principe. **Reports of the Sleeping Sickness Commission in Principe, December 1913 to March 1914.** [Published as a supplement to the "Gazette" of San Thomé and Principe. Translation forwarded to Foreign Office by Consul-General Hall Hall.]

These reports, like those for October and November, 1913 (summarised in this *Bulletin*, Vol. 4, p. 73), show a continued rapid and progressive diminution in the number of *G. palpalis* caught in the plantations in Principe, and a less marked diminution in the number of sleeping sickness cases detected. Probably many of these were old cases which the simpler methods had failed to discover; indeed some had been long suspect. Tables show for each plantation the number of persons examined in each month, the number found infected and how long these had been in the island, and the number of flies caught; the later tables show the number of men employed in this duty. The authors write: One can say that the dreaded transmitter of sleeping sickness has almost disappeared from the island.—Thus in November 1,368 flies were caught; in December 134; in January 19, though 171 persons were employed in catching them; in February 10, and in March 4; in February and March, 1913, the respective numbers were 11,865 and 9,450. The cases of sleeping sickness detected numbered 5, 3 and 5. The patients had resided in the island in some cases as long as 6 and 9 years, and none less than 1 year and 7 months.

An account is given of a visit paid by three members of the Commission to the land worked by the Sociedade de Agricultura Colonial, which is estimated to comprise about half the island and much of which is very favourable for tsetse. In 1908 the percentage of labourers infected was 23·9, in January 1914 it was 8 (total force 1,078). An "elaborate plan of sanitary works" had been carried out between August 1912 and August 1913, "consisting of extensive tree felling, earthworks, and draining of swamps, besides the killing of the swine and flies." The cost of this was amply compensated by the decrease

of native labourers entering hospital. During four days' search no tsetse could be found and horses were able to graze in safety. It is stated that each group of four brigade labourers carries a "piece of sackcloth" for fly catching in addition to sticky cloths.

As the Consul General remarks, no mention is made of any organised work in connection with land that is either unoccupied or occupied by natives. This is probably due to the insufficiency of staff, of which complaint is made in the reports. [From these and previous reports it is inferred that the great majority of tsetse are trapped by the method devised by MALDONADO (see *Sleeping Sickness Bulletin*, Vol. 2, p. 26). Seeing that this method has not been attended with such great success elsewhere, it would be useful to know the precise nature of the sticky substance used in Principe; it may be that it has a positive attraction for the flies which the substances used elsewhere have not.]

A. G. B.

BOLETIM OFICIAL DO GOVERNO DE PROVINCIA DE S. TOMÉ E PRINCIPE. —1914. July 15. Suplemento No. 8. pp. 4. **Relatorio da Missao da Doença do Sôno referente aos Mezes de Abril, Maio e Junho de 1914.** [Report of the Sleeping Sickness Commission for the three months, April to June 1914.]

The Commission report that during the period under review not a single specimen of *G. palpalis* had been captured on the island, although the numbers of the staff employed on the work had risen from 137 to 197 (Table III). Only one fresh case of sleeping sickness was detected, in the person of one of the fly-catching staff. Probably the infection had occurred some time previously. The number of individuals submitted to examination amounted to 1,345. Although the three months under review are comprised in the dry season, when the prevalence of the fly is at its lowest, the Commission hope that the improvement will be maintained. The proportion of cases of sleeping sickness detected to the number of bloods examined during two successive periods is shown in the following table:—

TABLE I.

Period.	Bloods examined.	Cases detected.	Per cent.
August, 1912–May, 1913 ..	3,992	125	3·13
October, 1913–June, 1914 ..	3,904	19	0·48

The ascertained length of residence on the island of the last 19 cases was as follows:—

TABLE II.

Length of residence	Number.
1–6 months	0
6–12 „	1
1–2 years	1
2–3 „	7
Over 3 „	10
Total ..	19

Presumably, therefore, the original date of infection was correspondingly remote.

The number of animals whose blood was examined for trypanosomes amounted to 255. Four cases of infection were found, all being in cattle. Three of the animals had been imported comparatively recently, either from the mainland of Africa or the Cape Verde Islands, while the fourth had been on the island for eight years, having also been originally imported. In this case the infection was of an exceedingly mild character, and the trypanosome of a type not previously met with.

TABLE III.

Showing the number of Glossina captured in the islands from 1911 to 1914 by the bird-lime process, and the number of the staff employed at the work:—

	1911		1912		1913		1914	
	Insects caught.	No. of staff.	Insects caught.	No. of staff.	Insects caught.	No. of staff.	Insects caught.	No. of staff.
January	17,705	Not given.	29,953	Not given.	21,434	139	19	171
February	14,705		18,025		11,865	139	10	173
March	14,005		12,885		9,450	139	4	173
April	13,705		10,175		6,000	139	1	197
May	14,000		7,907		4,200	139	..	197
June	18,000		9,771		3,158	139	..	197
July	19,001		13,036		2,768	139	..	..
August	10,600		16,301	139	2,934	139	..	..
September ..	14,175		18,850	139	2,700	139	..	..
October	13,937		15,973	139	2,311	139	..	..
November ..	23,596		22,450	139	1,368	163	..	..
December ..	30,200		22,000	139	134	163	..	..
Total	203,629		197,326		68,322		34	

J. B. N.

RINGENBACH. **Tournée Médicale effectuée de Brazzaville à Pointe-Noire (Moyen-Congo et Gabon) en Juin et Juillet 1912.**—*Ann. d'Hyg. et de Méd. Colon.* 1914. Apr.-May-June. Vol. 17. No. 2. pp 361-387.

The object of the tour was to get precise data as to the incidence of human trypanosomiasis in the country west of Brazzaville, between this place and the sea. From this country the Brazzaville market is supplied and most of the labour required by Europeans. It is proposed to make a railway between Loango and Brazzaville which would pass through the district examined. The investigations are described under three headings, the Bakongo District, the Bakougni District and the Gabun District. A diagnosis of sleeping sickness was made when direct examination of the blood or of the gland juice obtained by puncture was positive. It is noted that the natives always denied the existence of sleeping sickness in their villages even when it was quite common.

Bakongo District. The result of the investigations is shown in the table. The biting insects met with are enumerated. It was found that smallpox was widely spread. In one part of the district it was light, causing very few deaths. In another part, however, in a population of twelve villages amounting to 525, there had been 111 deaths, and 257 persons had a severe attack of the disease at the time they were seen. Notes are added on the incidence of yaws, leprosy, syphilis, tuberculosis and lung diseases.

Bakougni District. The incidence of sleeping sickness is shown in the table. One village in this district, Kinanga, was severely attacked.

District.	Examined.			Found Infected.			Total Examined.	Total Infected.	Percentage.
	M.	W.	C.	M.	W.	C.			
Bakongo ..	661	528	204	4	4	9	1393	17	1·2
Bakougni ..	196	538	330	16	25	13	1064	54	5·07
Gabun ..	150	213	229	13	7	1	592	21	3·5

Of 82 persons examined 16 were infected. The author gives data to show that this was an instance of what the French describe as "house epidemics." The case is mentioned of a native examined at a Catholic mission by ROUBAUD and found infected five years ago; he was now in excellent health, there were no puncturable glands, examination of his blood was negative, and there was no auto-agglutination. He had not had treatment.

Gabun District. The incidence of sleeping sickness is shown in the table. There are notes on the prevalence of other diseases.

Certain measures are recommended for application in these three districts.

A. G. B.

BEHRENS (CHARLES AUGUST). **An Attenuated Culture of** *Trypanosoma brucei.*—*Jl. of Infectious Diseases.* 1914. July. Vol. 15. No. 1. pp. 24–62.

The author points out that the production of active immunity may be brought about by the injection of living organisms—either fully virulent or attenuated—or dead organisms or their products. The injection of virulent organisms is uncertain and even dangerous; on the other hand, the injection of dead organisms is frequently ineffectual. The introduction of a slightly virulent organism suggests itself as the most suitable for the production of immunity.

Attenuation of an organism may be produced in various ways, such as by treatment with chemical substances, exposure to moderately high temperature or the action of light, by cultivation in immune serum, by passage through relatively insusceptible animals, and finally by long attenuated cultivation outside the body.

Behrens has adopted the last-named method in an attempt to produce an attenuated culture of *T. brucei*, and has, in part, succeeded

The following are the conclusions :—

"*Trypanosoma lewisi* gradually loses its virulence on cultivation, and is practically non-infective in the seventy-fifth generation.

"A dialyzed nutrient agar, plus serum (1 to 2) yields the most constant results in isolation of *Trypanosoma brucei*. The *Trypanosoma brucei* is capable of growing on hemoglobin-free medium.

"The continued cultivation of *Trypanosoma brucei* markedly attenuates the parasite, the latter becoming avirulent, except in few cases, for guinea-pigs and rabbits, and less virulent for rats, mice and dogs. In time, probably a wholly avirulent strain can be obtained.

"A single culture, seven days old, as yet invariably infects the rats, but when kept at room temperature for an additional one, two or three weeks it becomes less infective or not at all. Multiple injections of such aged cultures in some cases produce infection. The non-virulent cultures, twenty-eight days old, are still capable of growth in vitro.

"Cultures induce a subacute or chronic infection, the longest survival in rats being 265 days ; in guinea-pigs, 268 days.

"The blood of rats infected with cultures is infective for guinea-pigs after a very long period of incubation, and the guinea-pigs develop marked local lesions, especially about the genitalia. Trypanosomes can be demonstrated in these lesions.

"Consecutive passage of the attenuated strain through rats restores the virulence. This is accomplished more readily when the first passage is made with blood drawn shortly before death.

"The successful production of an attenuated strain opens the possibility of immunising animals against infection with *Trypanosoma brucei*."

W. Y.

Bayma (Theodoro). Um Caso de Mixedema Congenito. Apontamentos sobre a Distribuição do "Triatoma" no Estado de S. Paulo. [A Case of Congenital Myxoedema. Remarks on the Distribution of *Triatoma* in the State of San Paulo.]—*Revista Med. de S. Paulo.* 1913. Mar. 31. Vol. 16. No. 6. pp. 103-105. With 1 fig.

A description of a case of congenital myxoedema, with photograph, in a child of five years, of European origin, to show the difference between this condition and that produced by Chagas's disease. The child belonged to a family of Italian immigrants who were suspected by the proprietor of the estate on which they resided of being infected by the latter complaint, a few specimens of *T. megista* having been found in the neighbourhood. At the end of the paper is a list of localities in the State of San Paulo where *T. megista* and *T. infestans* have been found.

J. B. N.

MISCELLANEOUS.

Schilling-Torgau (V.). **Ueber die feinere Ausarbeitung der Blutmorphologie zur Erhöhung der klinischen Verwendbarkeit und zur Abgrenzung parasitärer Bestandteile auf dem Gebiete der Tropenkrankheiten.** [An Elaboration of the Blood Morphology for the purpose of Increasing its Clinical Value and demarcating the Parasitic Constituents in Tropical Diseases.]—*Trans. xvii Intern. Congress of Med.* London, 1913. Sect. xxi. Trop. Med. & Hyg. Pt. 2. pp. 299-307.

This interesting paper is divided up under the following headings : —

1. Improvement of smear technique (*Ausstrichtechnik*).
2. The use of Arneth's formula in the total leucocyte count.
3. The classification of the blood diseases by biological methods.
4. The use of modern cell histology for the blood cells in order to understand their pathological changes.

Under heading (2) Schilling now divides up the neutrophile leucocytes as follows :—

(*a*) Myelocyten ; (*b*) Jugendliche ; (*c*) Stabkernige ; (*d*) Segmentkernige.

Under heading (3) he classifies anaemia as follows :—

(1) Anaemia with red blood picture (mit/rotem Blutbild) without regeneration : (*a*) normal or pseudonormal, (*b*) purely regenerative (Poikilocytosis etc.).

(2) Anaemia with polychromatophilic erythrocyte picture : (*a*) purely regenerative (polychromatophilia, macrocytes), (*b*) with degeneration (basophilic points).

(3) Anaemia with normoblastic erythrocyte picture : (*a*) purely regenerative, (*b*) with degeneration.

(4) Anaemia with megaloblastic blood picture (megaloblasts and megalocytes).

The paper is a somewhat technical one and should be consulted in the original by those interested. It was accompanied by a lantern demonstration.

In a discussion which followed, Dr. Agramonte of Cuba claimed that the yellow fever parasites described by Seidelin were identical with bodies which Schilling showed on the screen in one of his preparations. He stated that the latter's interpretation of their significance was in perfect accord with what was known of the conditions of the blood in health and disease.

G. C. L.

Roemmele (A.) & Sweet (Robert). **Basophile Patches in the Protoplasm of the Neutrophile Polymorphs.**—*Lancet.* 1913. Aug. 9. pp. 384-385. With 1 text fig.

In the blood of a Brazilian sailor admitted into the Royal Infirmary, Glasgow, on November 16th, 1910, certain peculiarities were noted in the neutrophile polymorphonuclear leucocytes. The patient had previously suffered from acute rheumatism. On the day of admission there was a marked leucocytosis (90,600) and some marrow cells were present. In the neutrophiles a basophile patchy appearance

was observed in the protoplasm of many of the cells, the condition giving the appearance of a stage in the evolution of the development of the mature nucleus in the adult cell.

Stained by Jenner's and Giemsa's stains the spots were well seen, as was also the case with toluidin blue. In some cells four or five were seen, in others only one or two. These did not take any particular form, some being peripherally placed while others were attached to the nucleus by fine basophile strands. As the patient got better and the leucocytes returned to normal these appearances were no longer seen. A black and white sketch illustrates the condition.

G. C. L.

Froés (Joao A. G.). **Hemodiagnostico nos Tropicos. (Duas Lições de Clinica Medica).** [Haemodiagnosis of Tropical Diseases.]—pp. iii + 138. Bahia. 1913. Livraria Catilina de Romualdo dos Santos. With 2 figs. and 1 chart.

The importance of blood examinations in tropical diseases is familiar to all. The author in his little work draws attention to this again and furnishes some examples of cases where the diagnosis was made or verified by blood examinations.

G. C. L.

Gózony (L.). **Die Abderhaldensche Reaktion bei protozoischer und metazoischer Parasiteninfektion.** [Abderhalden's Reaction in Protozoal and Metazoal Infections.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1914. March 30. Vol. 73. No. 4/5. pp. 345-349.

The author tried Abderhalden's dialysation process in infections with various animal parasites and came to the following conclusions :—

1. With the use of organs (liver and lung) containing numerous trypanosomes, ferments of an apparently specific character could be demonstrated in the serum of trypanosome infected animals. The reaction was a group reaction, i.e. not specific for the various trypanosome species.
2. The reaction appears to be available in fowl spirochaetosis also.
3. In the case of sarcosporidiasis the protozoa were broken up. The reaction was specific.
4. In distomiasis the reaction was not specific. The worms were in some cases broken up by normal serum as well as by the serum from sick animals.
5. Rabbit and rat sera from trichinosed animals broke up muscle tissue, and trichinous muscle to a stronger degree.

Tables with controls are given in support of these statements. It may be noted that serum from a sleeping sickness patient reacted with liver and lung of a *T. brucei* infected rabbit.

[The basis of Abderhalden's reaction is the assumption that, if substances foreign to the blood enter the circulation, other substances (protective ferments) form in the blood which break up and render harmless the foreign substances. The serum to be tested for the presence of a particular ferment is brought into contact with tissue containing the suspected foreign body in a dialyser, and the dialysate is subsequently tested for the presence of peptone or alpha-amino acid. If these are found, it is concluded that the foreign albumin has been dealt with by proteolytic and peptolytic ferments, which have broken it up into peptone and alpha-amino acids. The reaction has been chiefly studied in connexion with the diagnosis of pregnancy, placenta forming the foreign substance.]

A. G. B.

Book Review.

Graham-Smith (G. S.), [M.D.]. **Flies in Relation to Disease. Non-Bloodsucking Flies.** Cambridge Public Health Series. 2nd Edit. xvi + 389 pp. With 32 text figs., 27 plates and 20 charts. 1914. Cambridge: at the University Press. [Price 12/6 net.]

That a second edition of this useful book should be required in less than twelve months from its first appearance will afford as much satisfaction to all who are interested in the sound progress of Medical Entomology as it must to the author himself.

The only feature of the new edition that now calls for notice is an Appendix of 87 pages, illustrated by three plates and sixteen charts, which not only brings the book up to date as a work of guidance and reference, but also records numerous valuable observations and experiments of the author's own.

The investigations of the meteorological conditions that affect in common the increase of flies and the incidence of summer diarrhoea are a model of assiduous and critical research. Among other original records are found some observations of "wild" blowflies, showing that in respect of the dimensions of head, thorax, and wing, no two specimens were in agreement; and some comparative experiments illustrating the effects upon adult blowflies of different kinds of food in the larval stage. The vexed question of the way in which houseflies pass the winter is also considered, the author being inclined to infer, from observed analogy with kindred species, that it is the pupa which hibernates. (Certainly the reviewer has been unsuccessful in his many attempts to get adult houseflies to live through the winter).

Among recent outside contributions to knowledge that are adequately noticed in the Appendix, attention may be invited particularly to Greig's demonstration of the actual existence of "cholera carriers," quite analogous with "typhoid carriers," and of the fact that such human carriers can accommodate the house-fly as a porter of the cholera vibrio; to the important observations of Mitzmain, and of Patton and Cragg, showing how certain ordinary flies that habitually feed on blood oozing from punctures made by biting-flies may be as dangerous in spreading infection as the biting-flies themselves; to the curious accounts of Surcouf and others of the transportation of the eggs of Dermatobia by mosquitoes; and to Bahr's work in Fiji on the connection between flies and dysentery.

Some attention is paid to the experimental observations of Hindle and Merriman on the range of flight of the house-fly; but the evidence is not ample enough to establish as a universal proposition the conclusion—which the author seems to endorse—that house-flies tend to travel either directly against the wind or across it. The accounts of Froggatt and others of the hurt suffered by sheep, particularly in Australia, from invasive maggots of Calliphora hatched from eggs deposited not in any wound, but on the wool in parts where it is most apt to be fouled, are also considered at some length. The matter is serious enough for the stockmaster, but surely it is going too far to speak of such an obviously regular declension from the blowfly standard as an impressive and significant change of habit.

There is an amplification of the first paragraph of the author's Preface which, as "preserving from decay the remembrance of what men have done," now satisfies the historic sense.

A. Alcock.

Yellow Fever Section.

Vol. 3, p. 186. Comment on Dr. Seidelin's paper on Vomiting Sickness in Jamaica. "Seidelin's researches do not advance the subject very much." Dr. Seidelin writes that he would make no objection to such a statement of a personal opinion, were it not that the abstract leads up to that verdict by omitting entirely any reference to the *Diplococcus jamaicensis* described for the first time in the report. He says also that this was the first time that detailed histological examinations were published.

Vol. 4, p. 153. Summary of Agramonte's paper on "A So-called Parasite of Yellow Fever." Line 5 from end, "two years" should be "a few years." The interval between Dr. Seidelin's illnesses was, in fact, 5 years and 7 months. In the same para., line 4 from top, after "late in the disease" the words "except in one instance" should be inserted. The effect of these slips is to strengthen Agramonte's criticism of Seidelin's bodies as the cause of yellow fever, which was not the intention of the reviewer.

Dr. Seidelin raises objections to other passages in the summary of this paper, but these passages are substantially Dr. Agramonte's.

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The Director will be glad to receive early copies of works or reprints on Tropical Diseases for notice in the *Bulletin* and for the Library. To be addressed—Tropical Diseases Bureau, Imperial Institute, London, S.W.

(Telephone:—Kensington, 5188.)

Reprints of Papers have been received from:—

BAHR (Dr. P. H.); BREINL (Dr. A.); PEARSON (Professor K.); SERGENT (Dr. Edm.).

BOOKS RECEIVED.

HEISER (Victor G.) [M.D.] Report of the Health for the Philippine Islands for the Short Fiscal Year from July 1, 1913 to December 31, 1913. —The Government of the Philippine Islands Department of the Interior Bureau of Health. 351 pp. 1914. Manila Bureau of Printing.

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